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Code 6510

INSTRUCTION MANUAL

FREQUENCY SELECTIVE VOLTMETER

MODEL 126A

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FREQUENCY SELECTIVE VOLTMETER

MODEL 126A

101-330

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NOTICE

WITH THE VOLTMETER CALIBRATED AND OPERATING NORMALLY, INTERNALLY GENERATED NOISE WILL DEFLECT THE METER SLIGHTLY UPSCALE. THIS NOISE SHOULD NOT EXCEED THE -20 DB MARK ON THE METER AND DOES NOT AFFECT THE MEASURING ACCURACY OVER THE SPECIFIED RANGE.

NEVER ADJUST MECHANICAL ZERO SET ON METER UNLESS POWER IS OFF.

MODEL 126A

ERRATA SHEET

Sierra Model 126A Frequency Selective Voltmeters, Serial No. 231 and above, have been modified for use with the Sierra Model 350A Tracking Signal Generator. The modification consists of the installation of a closed circuit telephone jack in the rear of the chassis and circuit changes to permit disconnecting the Local Oscillator.

When the Tracking Signal Generator interconnecting cable is plugged into the Model 126A, the plate supply voltage is removed from the Local Oscillator and buffer amplifier, and the Tuning Oscillator signal from the Tracking Signal Generator is fed into the input transformer, T2, of the balanced modulator. See Figure 2-1 and Schematic Diagram Figure 3-3.

In use the Tuning Oscillator signal of the Tracking Signal Generator takes the place of the Local Oscillator of the Model 126A permitting the instruments to be synchronously tuned by the adjustment of the frequency dial of the Tracking Signal Generator only.

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SECTION I

DESCRIPTION AND OPERATING INSTRUCTIONS

1. INTRODUCTION.

This handbook describes the Model 126A Frequency Selective Voltmeter and its accessories. The accessories are composed of the plug-in line bridging transformers Model 126-600, 126-135, 126-75 and of the High Impedance Probe Assembly Model 126/PA. The Frequency Selective Voltmeter Model 126A is furnished without line bridging transformer. The remaining accessories are available upon request.

The information contained in this handbook will enable the technician to perform operation, calibration and field maintenance procedures consistent with practices and recommendations of the manufacturer.

2. DESCRIPTION.

a. GENERAL. The Model 126A is a Frequency Selective Voltmeter designed to measure voltages in the frequency range of 5 kc to 1620 kc. A portion of the input circuit is formed by the voltmeter accessory, which is mounted in the front panel INPUT receptacle. When the Model 126A is used with either line bridging transformer accessory Model 126-600, 126-135 or 126-75, it presents a high input impedance when bridged respectively across a 600 Ω, 135 Ω or 75-ohm line. Combined with the High Impedance Probe Model 126/PA it presents a very high input impedance making it suitable for general purpose measurements. The 126A voltmeter is direct reading in dbm with any of its accessories. The output is read by algebraically adding the reading on the ATTENUATOR panel control to the meter display.

The Model 126A flexibility is greatly enhanced as it provides a choice of two selective bandwidths and in addition a flat voltmeter.

The Model 126A uses printed circuitry technique to alleviate the variation in stray effects and maintains constant characteristics in all instruments. Long life and sustained performance are insured by the selection of high temperature components and large derating of these components. Accuracy and stability over long periods of time and wide ambient temperature variation are maintained by including in the instrument design a highly regulated d-c supply and stabilized oscillators. Interferences and spurious generation are carefully controlled by thorough use of shielding and filtering networks.

b. FREQUENCY SELECTIVE VOLTMETER. Basically the Model 126A employs a single conversion principle which is most desirable as it results in a minimum of spurious responses. In addition the circuit incorporates a dual bandwidth feature which provides the capability of either broadband measurements or narrow bandwidth measurements where extra selectivity is required.

The two bandwidths are derived through the use of crystal filters in the intermediate frequency amplifier. The bandwidths provided are 2500 ~ and 250 ~. They are selected by placing the FUNCTION selector to the desired position. As a frequency selective voltmeter the Model 126A tunes from 5 kc to 1620 kc with a measurement sensitivity of +32 dbm to -90 dbm which corresponds to a voltage range of 30 volts to 24.5 microvolts.

c. FLAT VOLTMETER. In the FLAT position of the FUNCTION selector the Model 126A operates as a broadband a-c VTVM nearly flat from 5 kc to 1620 kc.

In the FLAT mode of operation the FUNCTION selector feeds the signal directly from the attenuator to the FLAT Voltmeter. Since the mixer and intermediate frequency amplifier are bypassed a loss of 60-db gain occurs. Consequently the FUNCTION selector simultaneously disables the -20 to -70 attenuator steps. This maintains the ATTENUATOR dial calibration, but limits the range from +32 dbm to -30 dbm which corresponds to a voltage range of 30 volts to 24.5 millivolts. The flat voltmeter is very useful in obtaining broad voltage measurement of the entire system under analysis. This measurement can be used to determine the relative level of the strongest signals in the system.

d. ACCESSORIES. The Model 126A accessories are an integral part of the input circuitry. They consist of a removable plug-in unit containing, for Models 126-600, 126-135 and 126-75, a bridging transformer, a d-c blocking capacitor, and connectors. It consists of a removable plug-in adaptor for the probe Model 126/PA.

Each of the accessories maintains the Model 126A voltmeter over-all specifications. Description of each accessory follows:

MODEL 126-600: Consists of a line bridging transformer intended to be used for measure-

TABLE 1-1. SPECIFICATIONS, MODEL 126A

FREQUENCY RANGE:	
Selective Voltmeter	
Wide band (2500 cps)	10 KC to 1620 KC*
Narrow band (250 cps)	5 KC to 1620 KC*
*In two frequency bands	5-810 and 810-1620 KC
Flat Voltmeter	5 KC to 1620 KC
INPUT LEVEL RANGE:	
(a) In association with accessories Model 126-600, 126-135, 126-75 (Line Bridging Transformers)	
Selective Voltmeter	-90 dbm to +32 dbm (24.5 μV to 30 volts)
Flat Voltmeter	-30 dbm to +32 dbm (24.5 mV to 30 volts)
(b) In association with accessory Model 126/PA (High Impedance Probe Assembly)	
Selective Voltmeter	-90 dbm to +2 dbm (24.5 μV to 1.0 volt)
Flat Voltmeter	-30 dbm to +2 dbm (24.5 mV to 1.0 volt)
(c) In association with Model 126/PA and 30 db Attenuator Pad	
Selective Voltmeter	-60 dbm to +32 dbm (1mV to 30 volts) 0 dbm to +32 dbm (1 volt to 30 volts)
MEASUREMENT ACCURACY:	
Selective Voltmeter	±1.5 db (-80 dbm to +32 dbm)
Flat Voltmeter	±0.75 db (-20 dbm to +32 dbm)
POWER INPUT:	105/125 volts, 50-1000 cps 60 watts
OVERALL DIMENSIONS:	
Width	17 inches
Height	10-1/8 inches
Depth	14-1/4 inches
WEIGHT (without accessories):	30 lbs.
AMBIENT TEMPERATURE RANGE:	50° F to 120° F
SELECTIVE VOLTMETER BAND-PASS:	
Wide band (2500 cps)	2500 cps (±1.25 KC) 3 db down 6000 cps (±3 KC) 30 db down 14,000 cps (±7 KC) 60 db down
Narrow band (250 cps)	250 cps (±125 cps) 3 db down 600 cps (±300 cps) 30 db down 1400 cps (±700 cps) 60 db down

TABLE 1-1. (Continued)

DIRECT READING:	
Using Accessory	
Model 126-600	Dbm or volts on 600 ohm, balanced or unbalanced lines
Model 126-135	Dbm on 135 ohm balanced or unbalanced lines
Model 126-75	Dbm on 75 ohm unbalanced lines
Model 126/PA	Volts on unbalanced circuits of any impedance
INPUT IMPEDANCE:	
Using Accessory	
Model 126-600	39,000 ohms nominal
Model 126-135	8,900 ohms nominal
Model 126-75	5,000 ohms nominal
Model 126/PA	50 megohms shunted by 6 pF
LINE BRIDGING LOSS:	
Using Accessory	
Model 126-600	0.3 db maximum
Model 126-135	0.3 db maximum
Model 126-75	0.3 db maximum
TUNING ACCURACY:	
At Room Temperature	±2 KC, 5 KC to 1620 KC
Over 50° F to 120° F Temperature Range	±3 KC, 5 KC to 1620 KC
SPURIOUS RESPONSE:	
Harmonic Distortion	Greater than 60 db down
Intermodulation Distortion	Greater than 50 db down
CALIBRATION OSCILLATOR:	100 KC ±0.01%
CARRIER REINSERTION OSCILLATORS:	
Lower Sideband	2.2135 mc ± 0.005%
Upper Sideband	2.2165 mc ± 0.005%

ments in 600-ohm system. The input impedance of the Model 126A voltmeter is nominally 39,000 ohms when used with this plug-in bridging transformer. The bridging loss incurred is always less than 0.3 db over the entire frequency range of 5 kc to 1620 kc.

The Model 126-600 can be used in either a balanced or an unbalanced system. Connecting the captive shorting link between ground terminal and the lower binding-post terminal grounds one side of the primary for unbalanced input.

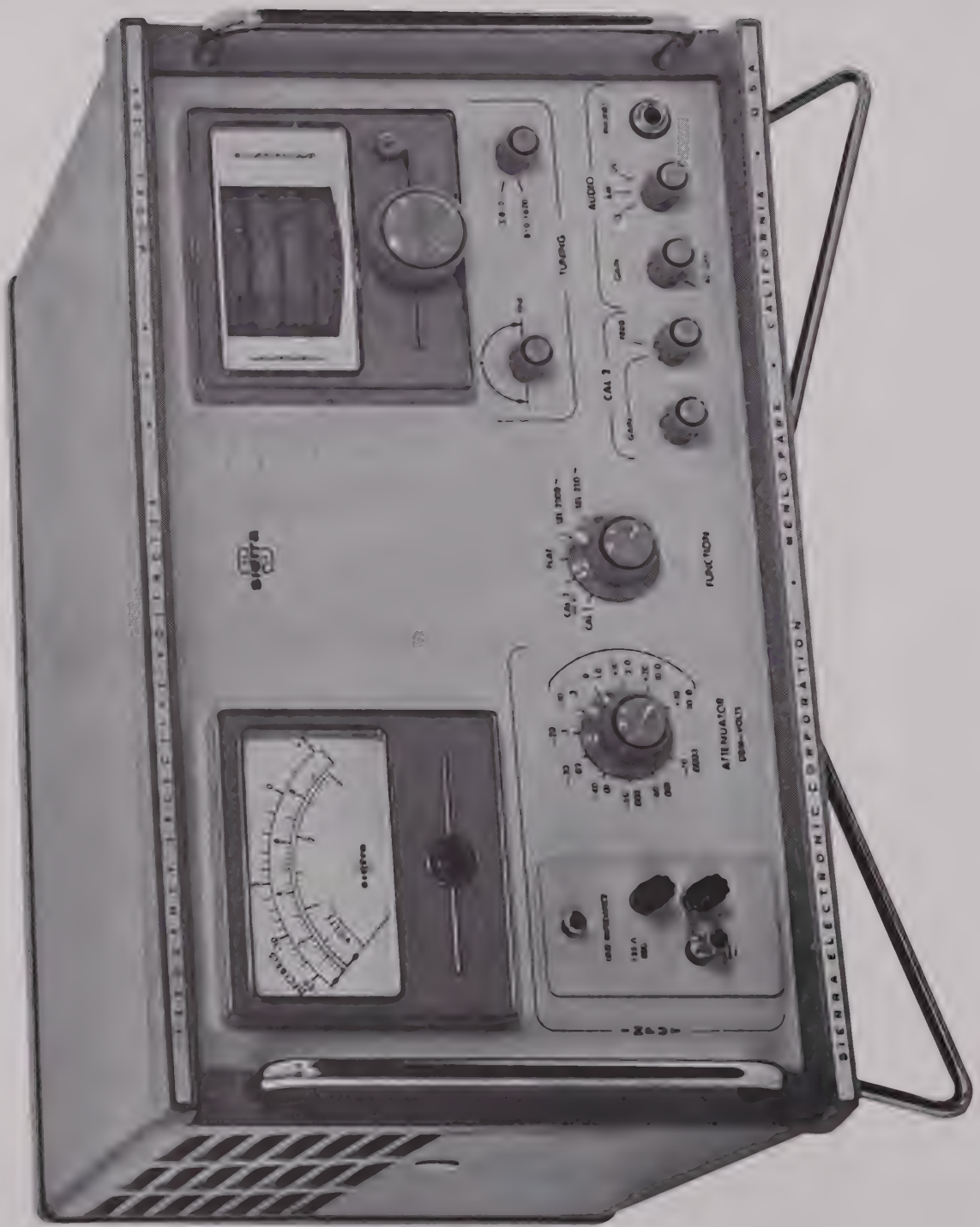

Figure 1-1. Model 126A

Figure 1-2. Model 126-600, 126-135, 126-75

Figure 1-3. Model 126/PA

MODEL 126-135: Consists of a line bridging transformer intended to be used for measurements in 135-ohm system. The input impedance of the Model 126A voltmeter is nominally 8,900 ohms when used with this plug-in bridging transformer. The bridging loss incurred is always less than 0.3 db over the entire frequency range of 5 kc to 1620 kc. The Model 126-135 can be used in either balanced or an unbalanced system. Connecting the captive shorting link between ground terminal and the power binding-post terminal grounds one side of the primary for unbalanced input.

MODEL 126-75: Consists of a line bridging transformer intended to be used for measurements in 75-ohm system. The input impedance of the 126A voltmeter is nominally 5,000 ohms when used with this plug-in bridging transformer. The bridging loss incurred is always less than 0.3 db over the entire frequency range of 5 kc to 1620 kc. The Model 126-75 presents an unbalanced input; connection is by means of a BNC connector.

MODEL 126/PA: Consists of the High Impedance Probe Assembly. The assembly is composed of the probe permanently connected to the adaptor unit by means of the electrical cable and of a 30-db attenuator pad. The probe cathode follower stage is powered by the 126A voltmeter. The Model 126/PA covers the sensitivity range of +2 dbm to -90 dbm, which corresponds to a voltage range of 1.0 volt to 24.5 microvolts. Where used with the 30-db attenuator pad which slips over the probe tip the sensitivity range is from +32 dbm to -40 dbm, which corresponds to a voltage range of 30 volts to 0.01 volt. The Model 126/PA input impedance is 50 megohms shunted by 6 picofarads.

3. PREPARATION.

a. When shipped from the manufacturer, Model 126A is packed in a cardboard shipping carton with suitable packing and re-inforcement to avoid shipping damage. To prepare instrument for use, remove the voltmeter from its shipping carton and inspect for damage. The instrument is shipped with tubes mounted; check to ascertain that all tubes are properly seated in their sockets. Prior to operating the voltmeter, a warm-up period of fifteen minutes is required to stabilize the circuitry. Power is applied by means of the line switch mounted on the audio GAIN panel control. The frequency dial light indicates power ON. Operation controls are listed in table 1-2.

4. OPERATIONAL CALIBRATION.

a. Model 126A is calibrated for operation using the internal 100-kc oscillator. The output from this oscillator, when FUNCTION switch S2 is in CAL 1 position, feeds a low distortion 100-kc signal to the input circuit of the voltmeter. This establishes a reference level, of approximately 0 dbm, utilizing the inherent accuracy and stability of the flat voltmeter, for the determination and adjustment of the CAL 2 (Gain) setting. Procedure for calibration follows:

TABLE 1-2. OPERATING CONTROLS

DESIGNATION	FUNCTION
AC OFF, GAIN	A-C power and AUDIO GAIN control.
PHONES	Headphone jack.
TUNING	Main tuning control (two-speed, in-out positioning).
FINE	Fine tuning control.
5-810/810-1620	Frequency Range Selector.
FUNCTION	Selects proper mode of operation (CAL 1, CAL 2, FLAT, SEL 2500~, SEL 250~).
ATTENUATOR	Calibrated selector reading amount of attenuation in db, and voltage range in volts (with accessory Model 126-600 only).
CAL 2 GAIN	Selective Voltmeter gain calibration.
CAL 2 FREQ.	Selective Voltmeter frequency calibration.
INPUT	Insert desired accessory.
LS-AM-US	Selects lower sideband, upper sideband or a-m mode of operation.

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(1) Allow fifteen (15) minutes warmup.

(2) Set ATTENUATOR at 0 db.

(3) Set FUNCTION at CAL 1.

Output meter will read approximately 0 dbm. Observe the exact reading of the meter (Example: Meter reads -0.5 dbm).

(4) Set FUNCTION at CAL 2.

(5) Set Frequency Hairline control to reference line and FINE tuning control to reference dot position. Switch frequency band to 5-810 position. Adjust tuning dial for maximum output meter response at 100 kc. Tune carefully in fine drive position (tuning knob pushed in) and peak with panel mounted FINE tuning control.

(6) If necessary, adjust CAL 2 (Gain) panel control so that output meter reads the same level noted in the CAL 1 position (Step 3 above). (Example: Meter reading of -0.5 dbm.) Instrument is now properly adjusted for measurement of external signals.

Note

An exact 0 dbm reading is not required to accurately calibrate the Model 126A. The CAL 1 check measures the output of the 100-kc oscillator accurately due to the flat voltmeter inherent accuracy and stability. It is then only necessary to set the CAL 2 level the same as read on CAL 1.

5. EXTERNAL SOURCE CALIBRATION.

a. It may be desired to use an external oscillator for calibration of the voltmeter at a specific frequency in order to obtain the greatest possible accuracy. Procedure for external source calibration is given below:

(1) Set up a stable, accurately calibrated r-f signal generator with 600-ohm output, a 600-ohm attenuator, and a 600-ohm termination, preferably in the form of an indicating thermocouple. At the expense of some accuracy, a non-inductive resistor and a VTVM may be used.

(2) At the desired calibration frequency, establish a signal generator level of 0 dbm (0.775 volts across the terminating resistance).

(3) Apply established 0 dbm power level to the voltmeter input terminals of the plug-in input transformer Model 126-600.

(4) Set FUNCTION at either SEL 2500 ~ or SEL 250 ~.

(5) Set voltmeter ATTENUATOR at 0 db.

(6) Adjust tuning dial and FINE panel control for maximum indication on the output meter.

(7) Adjust CAL 2 panel control for output meter reading of 0 db.

b. External source calibration for 135-ohm circuits may be accomplished in the manner described for 600-ohm measurements, substituting 135-ohm components in the external test circuits, and using Model 126-135 plug-in voltage across the 135-ohm termination shall be 0.367 volts.

c. External source calibration for 75-ohm circuits may be accomplished in the manner described for 600-ohm measurements, substituting 75-ohm termination in the external test circuits, and using plug-in transformer Model 126-75. Voltage across the 75-ohm termination shall be 0.275 volt.

d. External source calibration for the High Impedance Probe Model 126/PA may be accomplished in the same steps described in (2).

6. GENERAL MEASUREMENTS.

a. General circuit measurement procedure is detailed in the steps which follow:

(1) Calibrate voltmeter using either procedure indicated above. (See paragraph 4 or 5.)

(2) Select mode of operation with FUNCTION switch (FLAT, SEL 2500 ~ or SEL 250 ~).

(3) Connect signal for measurement to voltmeter input terminals or probe.

(4) Set HAIRLINE knob in reference position. Adjust tuning dial for maximum indication on output meter.

(5) Peak output meter with FINE tuning panel control.

(6) Set ATTENUATOR switch as required to obtain an on-scale reading.

(7) To obtain signal magnitude in dbm, add ATTENUATOR reading algebraically to that of the output meter.

b. HEADPHONE MONITORING. In the SEL 2500 ~ position, a headphone of any impedance with single plug may be used to continuously monitor audio signals. A panel control, GAIN, is provided to set the audio at a comfortable listening level. Output is taken from the panel jack designated PHONES.

SECTION II

THEORY OF OPERATION

1. THEORY OF OPERATION.

a. INPUT CIRCUIT. The input circuit consists of three sub-circuits, a plug-in accessory, an attenuator network, and portion of the FUNCTION selector.

b. ATTENUATOR switch S1 selects the portion of the attenuator network which corresponds to the panel marking in 10-db steps from -70 to +30 db. Output of S1 is applied to FUNCTION selector S2.

c. FUNCTION switch S2 in CAL 1 position feeds a 100-kc signal from the injection oscillator directly to the flat voltmeter. In CAL 2 position, the 100-kc signal is fed through a portion of the attenuator network (0-db position), through the mixer and crystal filter, FL 1, to the i-f amplifier, and then to the flat voltmeter. The input signal is applied directly to the flat voltmeter in FLAT position of the FUNCTION switch, and to the mixer input in SEL 2500~ and 250~ positions.

d. MIXER AND MODULATOR. Mixer V1 is essentially an amplifier, the gain of which is controlled at a rate which is equal to the local oscillator frequency (2.220 mc to 3.835 mc). The balanced modulator, consisting of CR4, CR5, CR6 and their associated components, acts as a switch which returns the cathode of V1 to a-c ground through R10 and C70. During half of the input cycle to the modulator, the balanced diodes conduct, and the modulator output is seen by C70 to be at a-c ground potential. Capacitor C70 bypasses cathode resistor R20 allowing V1 to function as an amplifier whose gain is on the order of 20 db, with R19 providing the cathode bias. During the other half of the input cycle, the diodes are non-conducting, and the modulator output is seen as a high impedance by C70. This places R20 in the cathode circuit of V1, biasing it to the point that gain through the mixer stage is about unity. Therefore, because the r-f voltage component from the local oscillator has been balanced out in the modulator, there are high order components in the mixer whose frequencies are the sum and difference of the input signal and the local oscillator signal, but essentially no r-f voltage appears in the mixer (local oscillator signal is down 35 db to 50 db at modulator output). Therefore, the local oscillator may be tuned within 5 kc of the i-f frequency without feeding through the mixer i-f section where it would otherwise appear as a spurious signal giving an erroneous indication on the output meter. The plate tank of the mixer is tuned to the frequency difference (2.215 mc) of the mixed components. The signal is then fed through the cathode follower V2 to crystal filter FL1 or FL2.

e. LOCAL OSCILLATOR. The local oscillator, V10, which provides the switching signal for the balanced modulator, tunes from 2.220 mc to 3.835 mc providing an intermediate frequency of 2.215 mc when mixed with 5 kc to 1620 kc input signals. The circuit is a two-band, highly stable temperature compensated Hartley oscillator, transformer coupled to the modulator. Frequency determining components are the tapped variable inductance L19, and capacitors C113, C114, C115, C62, C64, C65 for the high frequency range of 810 kc to 1620 kc. Variable inductance L20 and capacitors C116, C117, C118, C62, C63, C64, C65 are the frequency determining components for the low range of 5 kc to 810 kc. The tuning drive mechanism is connected to the shaft of C62, the main tuning capacitor. Capacitors C63 and C64 are compensating capacitors providing series negative temperature coefficient compensation. C65 is the fine-tuning panel control, an eccentric disc (rotor) which electrically loads and unloads a tab (stator) on the main tuning capacitor C62 for minute changes in frequency. Because C65 will rotate 360 degrees, to avoid tuning error, the fine-tuning control should be used over only 180 degrees as marked on the panel. Inductors L19 and L20 and capacitors C115 and C118 are for tracking adjustment purposes. Local oscillator output is fed to cathode follower V10B, for isolation and impedance matching. The local oscillator bezel assembly has an adjustable hairline which, in association with the internal calibration oscillator, allows to set the tracking accurately at every 100-kc multiple, for improved tracking within a particular dial area.

f. CRYSTAL FILTERS. Two selectivity positions are available in selective frequency operation using crystal filters with center frequencies of 2.215 mc, and bandwidths of 2500 cycles and 250 cycles. The output impedance of the cathode follower, V2, is about 4000 ohms, matching the input of the crystal filters. Wafers S2c and S2d switch the input and output of the desired filter, to feed (SEL 2500~, SEL 250~ and CAL 2) or by-pass (FLAT and CAL 1) the i-f

amplifier. The resistive T-pad network formed by resistors R34 through R37 provides a means of matching the filters to the i-f amplifier, and of balancing the filter outputs, with R42, to provide signals of equal amplitude for the i-f amplifier. Output of the T-pad is applied to the grid of V3.

g. I-F AMPLIFIER. The amplifier is comprised of two r-c coupled pentode stages, V3 and V4, which provide a combined gain of about 45 db. A single tuned grid is used to decrease the number of tuned circuit elements susceptible to the temperature gain instability. CAL 2 gain control R45 provides a means of varying the i-f gain through a range of at least 3 dbm either side of the nominal gain. Output of the i-f amplifier is applied to the grid of V5, the first flat voltmeter stage, through S2b.

h. FLAT VOLTMETER OPERATION. Three r-c coupled pentode stages and an associated output meter constitute the wide band flat voltmeter section. This amplifier has a gain of about 35 db, incorporating approximately 20 db of feedback to provide gain stability. Output meter readings are stable within 0.1 db for a line voltage change of ±10 percent, and for variations in tube g_m up to 25 percent.

Output from the last i-f stage, V4, is carried through S3b (in CAL 2, SEL 2500~ and SEL 250~ positions) to the grid of V5, the input amplifier stage of the flat voltmeter. Coupling capacitor C41 is a relatively small value (510 pf) and in conjunction with R56, provides a smooth fall-off in response below 1 kc. High frequency fall-off is controlled by capacitors C39 and C52 with R71, R51 and R64. The signal is further amplified in V6, and coupled to V7. Output of the three-stage amplifier is applied to the full-wave silicon diode bridge. Output meter M1 is connected across the bridge, and d-c current through the one milliampere movement is proportional to the average a-c voltage applied to the bridge.

In the CAL 1 and FLAT positions of the FUNCTION selector switch S2, signals other than 2.215 mc are applied to the flat voltmeter. In CAL 1, the 100-kc signal from the injection oscillator is used to calibrate the voltmeter as a reference against which the gain through the input-mixer i-f section is set. When S2 is in FLAT position, signals from 5 kc to 1620 kc may be fed to the voltmeter. In CAL 2, SEL 2500~, and SEL 250~, the input signal is first applied to the mixer i-f section, so that the signal reaching the flat voltmeter is 2.215 mc, the i-f output frequency.

i. AUDIO AMPLIFIER. A portion of the output of the last flat voltmeter stage is coupled from a plate resistive dividing network to the audio amplifier stage. The audio component of the signal thus applied is detected by a simple crystal diode demodulator comprised of CR3, L8, R67 and C54. The GAIN control, R82, determines the input level. The amplifier itself is a two-stage, twin-triode, r-c coupled circuit, the output of which is terminated at the panel mounted PHONES jack.

j. INJECTION OSCILLATOR. To provide a self-calibration capability, Model 126A includes an internally mounted 100-kc signal source which is applied in CAL 1 position of the function selector switch through the input attenuator to the flat voltmeter, and in CAL 2, to the mixer i-f section. The temperature compensated 100-kc oscillator is a modified crystal-controlled Pierce circuit which generates a signal of constant amplitude. Frequency accuracy is 0.01 percent over the specified temperature range. This signal is used to check the mixer i-f level and calibrate the flat voltmeter when used in the CAL 2 GAIN function. Output level is controlled with screwdriver adjusted potentiometer, R87.

When the CAL 2 switch is held in the CAL 2 FREQ. position, it provides a signal rich in harmonics and is used for checking oscillator tracking and tuning dial accuracy. The harmonics occur at every 100 kc multiple between 100 kc and 1600 kc.

k. POWER SUPPLY. The power supply for Model 126A is comprised of a full-wave silicon diode bridge rectifier, a series regulator, V11, and a twin triode cascade amplifier, V12. Voltage reference tube, V13, holds the grid of V12B at a constant value, thus a decrease in output voltage allows V12B to conduct more heavily because of the apparent, or relative, increase in grid voltage. The plate of V12B then becomes more negative because of the increased drop across R110, and the grid of V12A becomes more negative, decreasing the current through that stage, and increasing its plate voltage. Being directly connected to the plate of V12A, the grid of V11 will become more positive. The resulting decrease in voltage dropped across V11 will restore the original output voltage. D-c drift due to the effect of filament voltage changes in V13 is cancelled by differential action between the two sections of V12. Voltage adjustment potentiometer R113 establishes the operating level of the series regulator, and consequently the output voltage. Supply voltage is maintained at 225 volts, with regulation better than 0.25 percent over a line

voltage variation of 105 to 125 volts. Ripple amplitude is less than one millivolt. Input transient protection is provided with an r-c bridging network in the primary of T3, (R99-C88).

l. CARRIER REINSERTION. For measurement of single-sideband signals, this model includes in its circuitry, two crystal-controlled carrier reinsertion oscillators and a cathode follower. One triode oscillator, for lower sideband reception, operates at 1.5 kc below the i-f frequency. For upper sideband reception, the second oscillator operates at 1.5 kc above the i-f frequency. One of these two signals is applied as required through the cathode-follower stage to the diode demodulator at the input of the audio amplifier where it is combined with the carrier-suppressed sideband signal from the output of the flat amplifier. The reinserted carrier from the internal oscillator provides an r-f base against which sideband signals beat, forming a combined signal which is reduced to its audio component at the demodulator. LS-AM-US switch, S3, selects the proper oscillator, and applies plate voltage for its operation. All three triode stages of the circuit are combined in a single envelope, V14.

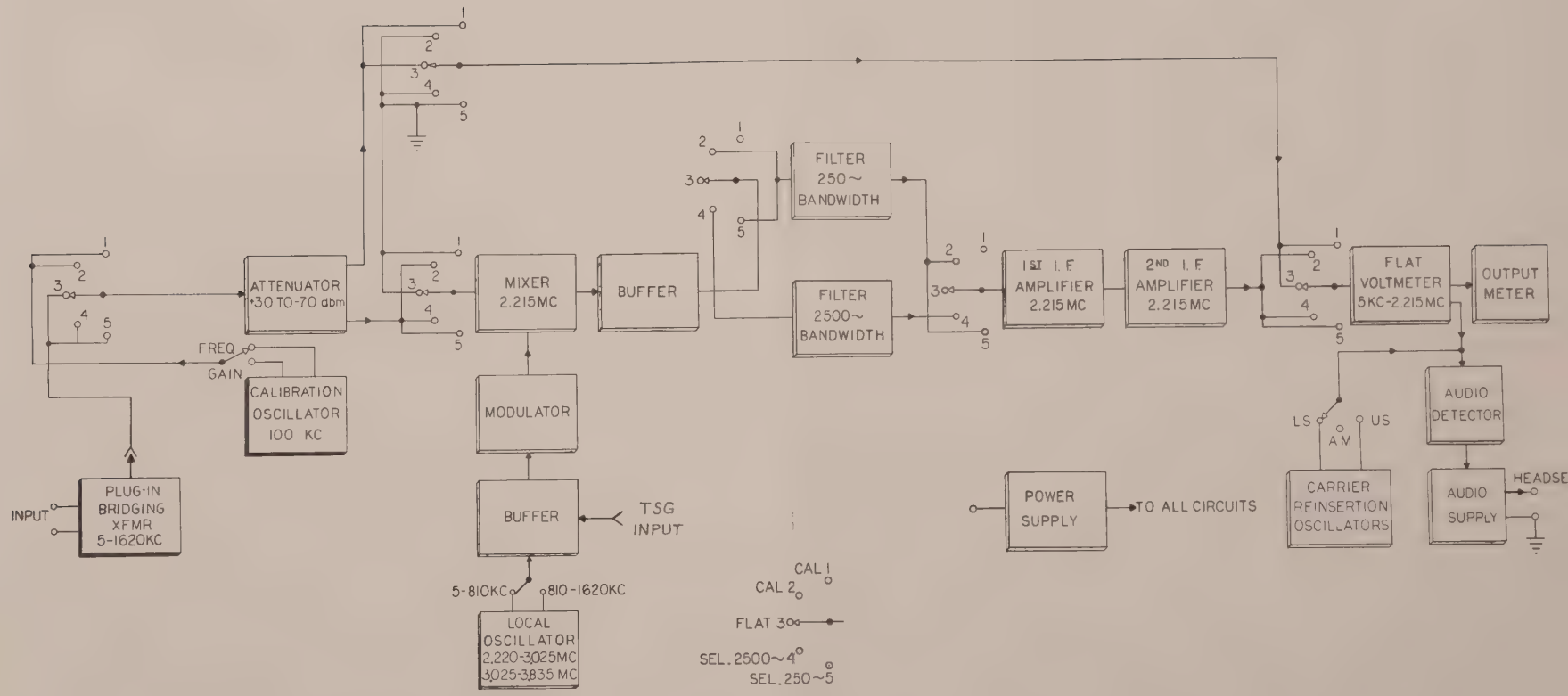

Figure 2-1. Functional Block Diagram, Model 126A

SECTION III

CALIBRATION AND MAINTENANCE

1. CALIBRATION.

a. GENERAL. Calibration procedures described in this section may be conducted independently. For complete calibration to manufacturer's recommended specifications, each unit of the voltmeter should be calibrated in the sequence presented in this section. Adjustment difficulties may indicate circuit malfunction. Refer to paragraph 2 for troubleshooting information.

b. POWER SUPPLY ADJUSTMENT. Using a d-c vacuum tube voltmeter, perform the following steps:

(1) Connect the d-c VTVM between TP1 and chassis ground.

(2) Adjust R113 for an output voltage of 225 volts.

(3) Vary line voltage from 105 to 125 volts; there should be no change in output voltage in excess of 0.25 percent.

(4) Using a d-c VTVM and short, shielded connections, observe ripple and noise components; they should not exceed 1.0 millivolt over a line voltage variation of 105 to 125 volts. Whenever noise and ripple are less than 1.0 millivolt combined, regulation will be within specification.

c. FLAT VOLTMETER ADJUSTMENT. Allow fifteen minutes for warmup. When circuits have stabilized, proceed using the method described below:

(1) Insert the plug-in transformer Model 126-600.

(2) Set FUNCTION to FLAT.

(3) Set ATTENUATOR at 0 db.

(4) Connect a low distortion r-f signal generator to the input binding posts.

(5) Calibrate signal generator for 0 db output at 100 kc.

(6) Adjust amplifier gain at R71 for an output meter reading of 0 dbm.

(7) Tune signal generator successively to 5 kc, 100, 200, 400, 600, 800, 1000, 1200, 1400, 1620 kc at 0-db level, and record output meter reading for each frequency. Variation should be less than ±0.3 db.

(8) Repeat step (7) with Model 126-135 plug-in transformer.

(9) Repeat step (7) with Model 126-75 plug-in transformer.

(10) Repeat step (7) with Model 126/PA high impedance probe.

d. Output meter linearity determination requires an attenuator of 600 ohms impedance and an r-f signal generator Procedure is indicated below:

(1) Apply a 100-kc, 0-db signal to Model 126-600 through external attenuator.

(2) Set external attenuator for straight-through operation, i.e., no attenuation.

(3) Set voltmeter FUNCTION to FLAT. Set voltmeter ATTENUATOR at 0 db. Output meter should read 0 db.

(4) Attenuate the input signal in 1-db steps to -10 db, recording the output meter reading at each step. All readings should be within ±0.2 dbm of the actual attenuated input level.

(5) Increase attenuation to -15 db. Output meter should read within ±0.5 dbm.

(6) Increase attenuation to -20 db. Output meter should read within ±1.0 dbm.

e. MIXER I-F PRELIMINARY ADJUSTMENT. Initial adjustment procedures for the mixer i-f section are listed below:

(1) Set FUNCTION to SEL 2500 ~.

(2) Set ATTENUATOR at 0 db.

(3) Set CAL 2 fully clockwise.

(4) Insert any of the plug-in transformer units.

(5) Feed a 2.215-mc signal from an external r-f source to the input of the voltmeter at a level which will give half-scale deflection of the output meter.

(6) Tune L3, L4 and L5 progressively for maximum meter indication. Reduce input signal as required to maintain half-scale indication.

f. LOCAL OSCILLATOR ADJUSTMENT. Following a thirty-minute warm-up period, track the local oscillator in the following manner:

A. Low Frequency Range

(1) Set FUNCTION to SEL 2500 ~ .

(2) Set ATTENUATOR at 0 db.

(3) Set FINE tuning control at midpoint. Set HAIRLINE control at reference position. Set TUNING range at 5-810.

(4) Place 5-kc tuning dial mark on indicator hairline.

(5) At 0-db level, feed 5-kc signal to voltmeter, and tune L20 for maximum meter deflection.

(6) At 0-db level, feed 810-kc signal to voltmeter, and tune C118 for maximum meter deflection.

(7) Repeat steps (5) and (6) as needed to set upper and lower frequency extremes of the band.

(8) Should some of the frequencies in between not track within ±1 kc, bend the serrated plates of C62 to improve tracking to specified tolerance.

B. High Frequency Range

(1) High frequency range to be checked and adjusted only after the low frequency range procedure has been completed.

(2) Set FINE tuning control at midpoint. Set HAIRLINE control at reference position. Set TUNING range at 810-1620.

(3) Place 810-kc tuning dial mark on indicator hairline.

(4) At 0-db level, feed 810 kc to voltmeter, and tune L19 for maximum meter deflection.

(5) At 0-db level, feed 1620-kc to voltmeter, and tune C115 for maximum meter deflection.

(6) Repeat steps (4) and (5) as needed to set upper and lower frequency extremes of the band.

g. MODULATOR ADJUSTMENT. Balanced modulator adjustment requires an oscilloscope; procedure is described below:

(1) Turn instrument on; allow fifteen minutes for circuit to stabilize.

(2) Set FUNCTION to SEL 2500 ~ .

(3) Remove modulator cover and with the oscilloscope read the r-f envelope amplitude alternately at C66 and C67, adjusting R100 until the two amplitudes are equal.

(4) Replace the modulator cover, set the frequency dial at 5 kc, leaving FUNCTION set at SEL 2500 ~ .

(5) Tune C66, C67, C68 and C69 for minimum signal indication, correcting each interaction until the residual output meter reading is as low as obtainable. Spurious harmonic generation should be at least 63 db down. Tune the frequency dial to 5 kc; residual reading should not exceed -20 db. A non-metallic screwdriver must be used in this procedure.

NOTE

The meter reading during this operation is not affected by the attenuator. Detected voltage is due to local oscillator feedthrough.

h. INJECTION OSCILLATOR OUTPUT. No provision is made for adjustment of the injection oscillator frequency. It may be desired, however, to check the frequency to see that it remains within the specified tolerance. Measured frequency at TP10, using an accurate counter or frequency meter, shall be 100 kc ±0.01 percent.

i. The injection oscillator r-f output level is set in the following manner after checking the Flat Voltmeter adjustment (paragraph 1d.).

(1) Set FUNCTION to CAL 1.

(2) Set ATTENUATOR to 0 db.

(3) Adjust R87 for an output meter reading of 0 dbm.

j. MIXER I-F FINAL TUNING. Final adjustment of the mixer i-f section is described below:

(1) Set FUNCTION to SEL 250 ~ .

(2) Set ATTENUATOR to 0 db.

(3) Set CAL 2 at mid-position.

(4) Feed a 100-kc signal at 0-db to the input of the voltmeter.

(5) Tune voltmeter to the input signal, and peak output meter indication with the FINE tuning control.

(6) Tune L3, L4 and L5 for maximum output meter deflection.

k. CAL 2 RANGE. With a 0-db input signal and CAL 2 control set fully clockwise, output meter should read at least +3 db. Turning the CAL 2 control fully counterclockwise should bring the reading down to at least -3 db.

l. 2500 CYCLE BANDWIDTH CHECK. Although the 2500 ~ and 250 ~ crystal filters are not adjustable, a complete calibration procedure should include a check of filter response. A method of determining bandwidth is described below:

(1) Set ATTENUATOR to 0 db.

(2) Set FUNCTION to SEL 2500 ~ .

(3) Apply 0-db signal at 20 kc to input of voltmeter.

(4) Tune voltmeter to incoming signal, and adjust CAL 2 for 0-db output meter indication.

(5) Increase input signal frequency from 20 kc until output meter indication decreases 0.2 db. Record frequency.

(6) Decrease input signal frequency from 20 kc until output meter indication decreases 0.2 db. Record frequency. The sum of the differences in frequency obtained in steps (5) and (6) is the nose width of the response curve at 2500 cycles and should be approximately 1.0 kc. Using similar technique, 3-db bandwidth should be 2.5 kc, and 60-db skirt width should be about 14 kc.

m. 250 CYCLE BANDWIDTH CHECK. Using the method described in paragraph 1 (l), bandwidth at the 0.2-db points of the 250-cycle filter curve should be 75 cycles, the 3-db points should be 250 cycles, and the 60-db points about 1400 cycles.

n. FILTER OUTPUT LEVEL MATCHING. To ensure proper input level to the i-f strip, the crystal filter outputs are balanced in the following manner:

(1) Set FUNCTION to SEL 2500 ~ .

(2) Feed a 100-kc, 0-db signal to voltmeter input binding post. Tune carefully for maximum output meter deflection. Record meter reading.

(3) Set FUNCTION to SEL 250 ~ .

(4) Retune for maximum meter deflection. If reading varies from that recorded in the SEL 2500 ~ position, adjust R42 so that output indications are equal at 2500 cycles and 250 cycles.

o. ATTENUATOR STEP CHECK. The attenuator is checked using a signal generator, an external decade attenuator and an a-c VTVM accurate to 1 percent. Procedure follows:

(1) Set ATTENUATOR at +20 db.

(2) Set FUNCTION at SEL 250 ~ .

(3) Insert plug-in transformer Model 126-600.

(4) Apply a 20-kc signal at 20-db level to voltmeter; binding posts in unbalanced connection.

(5) Switch ATTENUATOR to +30 db. Output meter should read -10 db.

(6) Attenuate input signal 10 db using decade attenuator and switch voltmeter ATTENUATOR to +10 db. Output meter should read 0 db ±0.5 db.

(7) Attenuate input signal in 10-db steps while increasing voltmeter sensitivity in 10-db steps to -70 db. Output meter should remain accurate to ±0.2 db.

(8) Repeat steps (1) through (7) using Model 126-135 plug-in transformer.

(9) Repeat steps (1) through (7) using Model 126-75 plug-in transformer.

(10) Set ATTENUATOR at 0 db. Set FUNCTION at SEL 250 ~ . Insert Model 126/PA High Impedance Probe adaptor in voltmeter input.

(11) Apply a 20-kc signal at 0 db level to the probe. The output meter reading should be 0 db ±0.1 db. If not, remove probe tip and adjust trimmer capacitor C3.

(12) Attenuate signal in 10-db steps while increasing voltmeter sensitivity in 10-db steps to -70 db. Output meter should remain accurate to ±0.4 db.

(13) Slip the 30-db attenuator pad over the probe tip. Apply a 20-kc signal at +30-db level to the probe and set the voltmeter attenuator to 0 db. The output meter reading should be 0 db ±0.1 db. If different, remove pad tip and adjust trimmer capacitor C1.

(14) Attenuate signal in 10-db steps while increasing voltmeter sensitivity in 10-db steps to -30 db. Output meter should remain accurate to ±0.5 db.

p. SELECTIVE VOLTMETER RESPONSE. Using a signal generator and an a-c VTVM, determine voltmeter linearity in selective operation using the following procedure:

(1) Insert Model 126-600 plug-in transformer. Set FUNCTION to SEL 250~. Set TUNING range to 5-810.

(2) Set ATTENUATOR at 0 db.

(3) Apply 100-kc signal to voltmeter at 0 db.

(4) Tune and peak voltmeter to incoming signal.

(5) Adjust CAL 2 for 0 db on output meter.

(6) At 5 kc, 100 kc, 200, 300, 400, 500, 600, 700, 810 kc, all at 0-db input level, record output meter readings. All readings should be 0 db, ±0.2 db.

(7) Set TUNING range to 810-1620.

(8) Apply 810-kc signal to voltmeter at 0-db level. Output meter reading should be within 0.2 db of reading for 810 kc recorded in step (6).

(9) At 900, 1000, 1100, 1200, 1300, 1400, 1500, 1620 kc all at 0-db input level, record output meter readings. All readings should be within ±0.2 db of the level recorded for 810 kc in step (8).

(10) Repeat step (1) through (9) using Model 126-135 plug-in transformer.

(11) Repeat step (1) through (9) using Model 126-75 plug-in transformer.

(12) Repeat step (1) through (9) using Model 126/PA High Impedance Probe.

q. INTERMODULATION MEASUREMENT. Frequencies of 72.5 kc and 100 kc at 0-db level are fed to the voltmeter input, or probe input, through a mixing pad to determine intermodulation characteristics of the voltmeter. Proceed in the following manner:

(1) Set FUNCTION at SEL 2500~.

(2) Set ATTENUATOR at 0 db.

(3) Apply mixed frequencies to voltmeter.

(4) Adjust CAL 2 for 0-db output meter indication. Do not disturb CAL 2 or input signal generators for remainder of the test.

(5) Tune the voltmeter to the following frequencies with ATTENUATOR at -50 db:

172.5 kc	245.0 kc
27.5 kc	127.5 kc
45.0 kc	272.5 kc

These are all sums or differences of the two input frequencies and should measure less than -50 db on the output meter.

r. NOISE LEVEL. Normal noise in the instrument in SEL 2500~ position is about -20 db with CAL 2 fully clockwise. Most circuit noise is generated in the mixer stage and cannot be eliminated without deteriorating mixer performance. Noise may be read directly on the output meter.

2. MAINTENANCE.

a. TROUBLE SHOOTING. Malfunctions can usually be determined rapidly using a sectionalizing system in conjunction with references to the equipment block diagram. First, determine the correct operation of the power supply, checking the output voltage and ripple content. Excessive ripple and noise are due to power supply or decoupling network failure. Second, determine that the flat voltmeter operates correctly, since all other circuitry depends on its operation. Then approach the injection oscillator, mixer, i-f, and local oscillator sections. Occasionally coupling or decoupling capacitors leak only under conditions of high ambient temperature, and removal of the equipment from its cabinet may cause the fault to disappear. Microphonics are usually caused by poor switch contacts, loose solder joints or defective tubes. For resistance and voltage measurement, refer to tables 3-2 and 3-3. For troubleshooting tips see table 3-1.

b. Care should be exercised in working on printed circuit boards. Remember that excessive

heat will destroy the board and its circuitry. Use only enough heat, using some form of heat sink, to remove the component. Remount all components close to the board to avoid mechanical strain on leads.

c. PROBE. To have access to the Model 126/PA circuitry, proceed as follows:

(1) Loosen probe cable packing gland.

(2) Hold body and tip firmly in place, rotate CCW and they will separate. Rotation of probe tip and body in respect to each other is not permissible as this results in damage to the electrical assembly. (The assembly ring is composed of a right and left thread.)

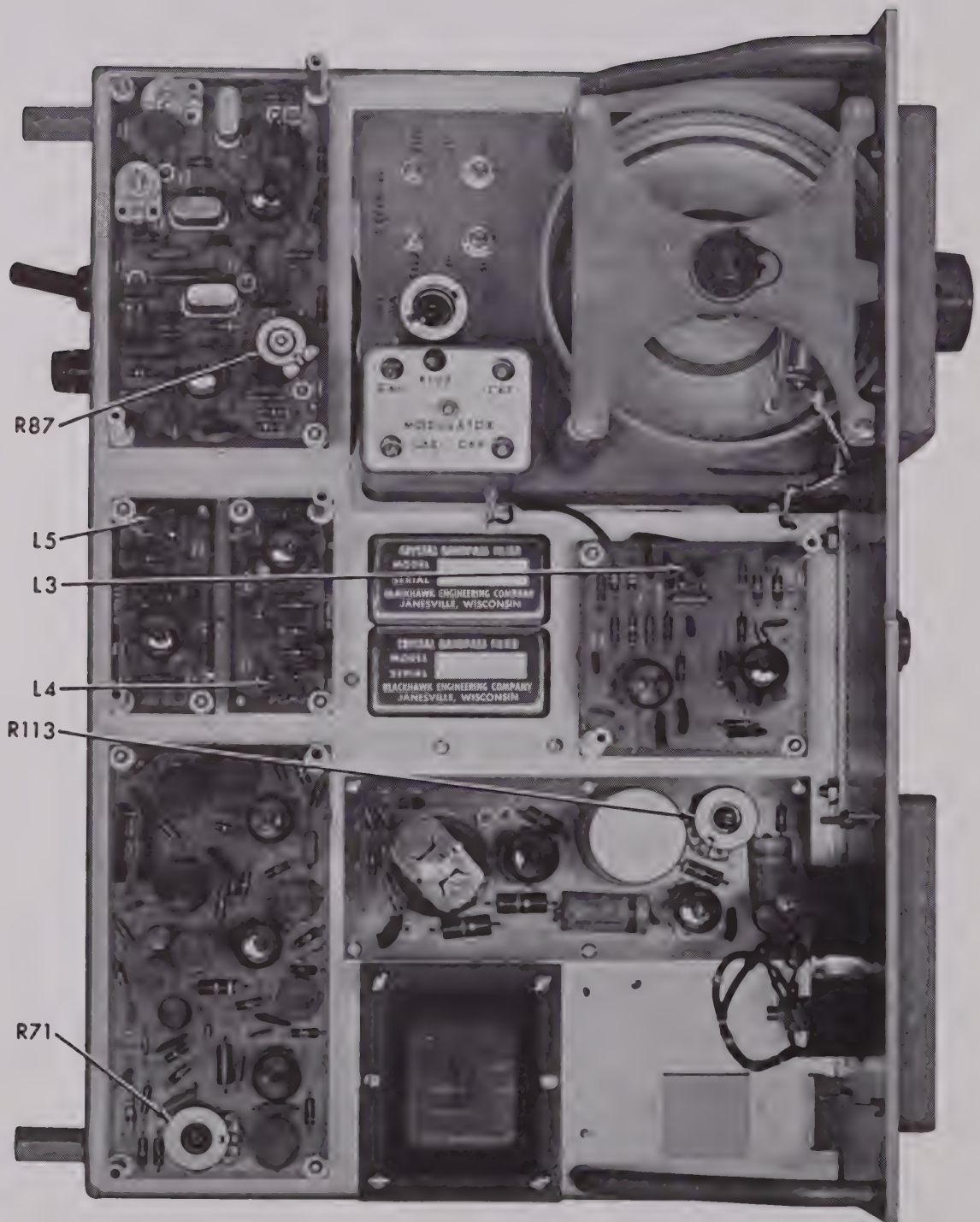

Figure 3-1. Component Identification, Model 126A, Top View

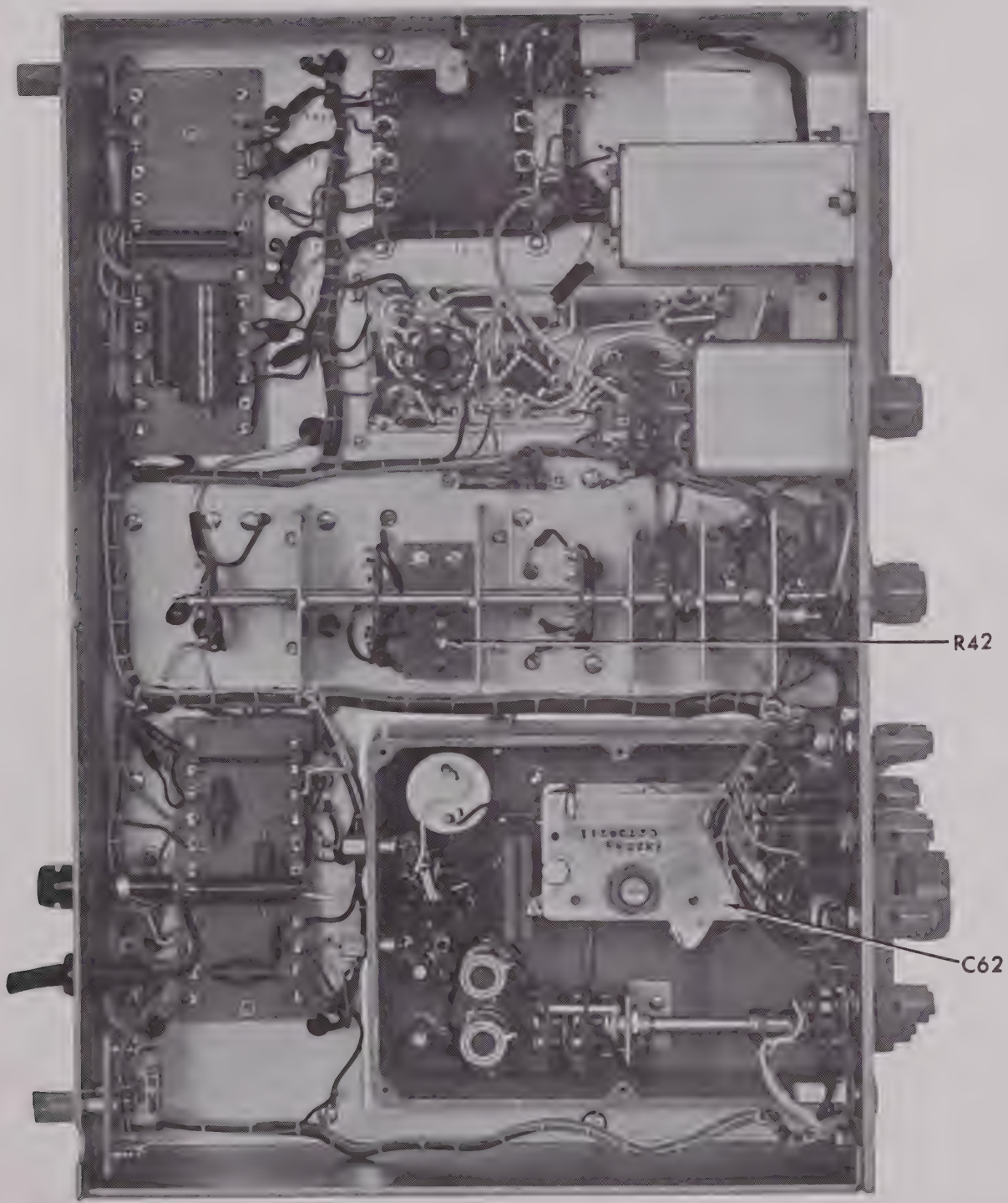

Figure 3-2. Component Identification, Model 126A, Bottom View

TABLE 3-1. TROUBLE SHOOTING TIPS

TROUBLE	PROBABLE CAUSE	REMEDY
No power, Panel Switch "ON"	1. No line voltage. 2. Defective power 3. Fuse F1 blown.	1. Check line voltage.
Fuse F1 Blown	1. Burned out diode in power supply.	1. Replace diodes.
	2. Short in d-c supply.	2. Determine cause, repair.
	3. Short in filament supply	3. Determine cause, repair.
No meter reading in CAL 1 position	1. Injection oscillator failure.	1. Check V9, Y1, replace if necessary.
	2. Flat amplifier failure.	2. Check V5, V6, V7, CR1, CR2, replace if necessary.
	3. Power supply failure.	3. Check V11, V12, replace if necessary.
	4. Function switch failure.	4. Check wafers contacts. Repair or replace.
	5. Wiring failure.	5. Check oscillator shielded output lead for short or open circuit.
No meter reading in CAL 2 position (CAL 1 functions properly) or No meter reading in SEL 2500~ and SEL 250~	1. Local Oscillator failure.	1. Check V10, CR4, CR5, CR6, replace if necessary.
	2. Mixer failure.	2. Check V1, V2, replace if necessary.
	3. I-F failure.	3. Check V3, V4, replace if necessary.
	4. Function switch failure.	4. Check wafers contacts; repair or replace.
Unable to set 0 db in CAL 2 position	1. Local oscillator output low.	1. Check CR4, CR5, CR6, replace if necessary.
	2. Detuned circuit in mixer of I-F stages.	2. Retune L3, L4, L5.
	3. Low overall gain	3. Check V1 through V7 and replace if necessary.
	4. Injection Oscillator output low.	4. Check V9, Y1, replace if necessary.
Excessive "no signal" meter indication	1. Faulty modulator.	1. Check, replace CR4, CR5, CR6 if required (CR4, CR5 are a matched pair replacement).
	2. Detuned modulator.	2. Retune modulator.
	3. Loose oscillator or modulator cover.	3. Tighten cover.
Non linear output meter response	1. Defective meter diodes.	1. Check or replace CR1, CR2.
	2. Defective meter.	2. Check or replace meter.

TABLE 3-1. (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Unable to tune incoming signal (instrument operates correctly in CAL 2)	1. Open input circuit.	1. Check plug-in transformer.
	2. Defective plug-in transformer.	2. Check or replace transformer.
	3. Faulty FUNCTION selector.	3. Check contacts, repair or replace.
Frequency Tuning Error	1. Local oscillator not tracking properly.	1. Check and adjust per paragraph 1f.
	2. Loose local oscillator drum or variable capacitor coupling.	2. Check and repair.
	3. Local oscillator shift in frequency range.	3. Defective L19, L20, C62 through C65, C113 through C118.
Unequal readings in SEL 2500~ and SEL 250~	1. Filter output level not matched.	1. Adjust R42.
	2. Defective filter, excessive loss.	2. Replace FL1 or FL2.
Unequal reading in SEL 250~ and CAL 2 (after proper calibration)	1. Loss of regulation in power supply.	1. Check or replace V11, V13.
Poor regulation of power supply output	1. Line voltage too high or too low.	1. Check line voltage.
	2. Defective tubes.	2. Check or replace V11, V12, V13.
	3. Open or leaky capacitor.	3. Check or replace C80, C83, C82.
Power supply delivers excessive d-c output voltage.	1. Regulator V13.	1. Check or replace.
	2. Amplifier V12.	2. Check or replace

TABLE 3-2. RESISTANCE VALUES*

TEST POINT		RESISTANCE IN OHMS
Power Supply		
T3	1 and 2	inf.
T3	7 and 8	inf.
T3	3 and 4	30K
T3	5	0.5 ohm max.
*Measurements made with 20K/ohm/voltmeter.		
T3	6	0
V11	pin 1	560K
V11	pin 3(TP1)	30K
V12	pin 1	560K
V12	pin 2	560K
V12	pin 3	18K
V12	pin 6	560K
V12	pin 7	95K
V12	pin 8	22K
V13	pins 1, 5	95K
V13	pins 2, 4, 7	0
Mixer		
TP4		30K
TP6		250K
TP7		4.7K
TP8		inf.

TEST POINT		RESISTANCE IN OHMS
Local Oscillator		
V10	pin 1	80K approx.
V10	pin 2	100K
V10	pin 3	.3
V10	pin 6	30K
V10	pin 7	1 meg
V10	pin 8	1K
C76	(TP29)	30K
T2	1	4.6
T2	3	0
Modulator		
TP31		4700
T2	1	4.6
T2	3 and 5	0
T2	4	45
T2	6	45
I-F Amplifier		
TP13		2.2K
TP14		30K approx.
TP15		.11
TP16		.11
TP18		0 to 2.5K
TP19		30K approx.
TP20		.11

TABLE 3-3. VOLTAGE REFERENCE CHART*

TP NO. OR LOCATION	VOLTAGE
Power Supply	
TP	225 vdc + .25% (105 to 125 vac)
TP2 and TP3	6.3 vac across terminal
V11 pin 5	350 vdc
V12 pin 1	210 vdc
V12 pin 2, 6	130 vdc
V12 pin 3	132 vdc
V12 pin 8	86 vdc
V13 pins 1, 5	87 vdc
Mixer-Cathode Follower	
TP4	225 vdc
TP5	6.3 vac
TP6	variable rms
TP7	34 vdc
V1 pin 5	198 vdc
V1 pin 6	145 vdc
V2 pin 2	2.4 vdc
V2 pins 5, 6, and 7	47 vdc
I-F Amplifier	
TP13	Variable rms
TP14	225 vdc
TP16	Variable rms
TP19	225 vdc
I-F Amplifier (Cont)	
TP20	Variable rms
V3 pin 2	.5 vdc
V3 pin 5	74 vdc
V3 pin 6	40 vdc
V4 pin 2	9.1 vdc R55 at
V4 pin 5	156 vdc max. re
V4 pin 6	120 vdc resistance
Flat Amplifier	
V5 pins 2, 7	0.6 vdc
V5 pin 5	131 vdc
V5 pin 6	62 vdc
V6 pins 2, 7	1 vdc
V6 pin 5	200 vdc
V6 pin 6	100 vdc
V7 pins 2, 7	1.0 vdc
V7 pin 5	155 vdc
V7 pin 6	100 vdc
TP25, TP26	154 vdc
Injection Oscillator	
TP10	225 vdc
V9 pin 3	.9 vdc
V9 pin 6	62 vdc
V9 pin 8	12 vdc

*Measurements made with 20K/ohms/voltmeter.

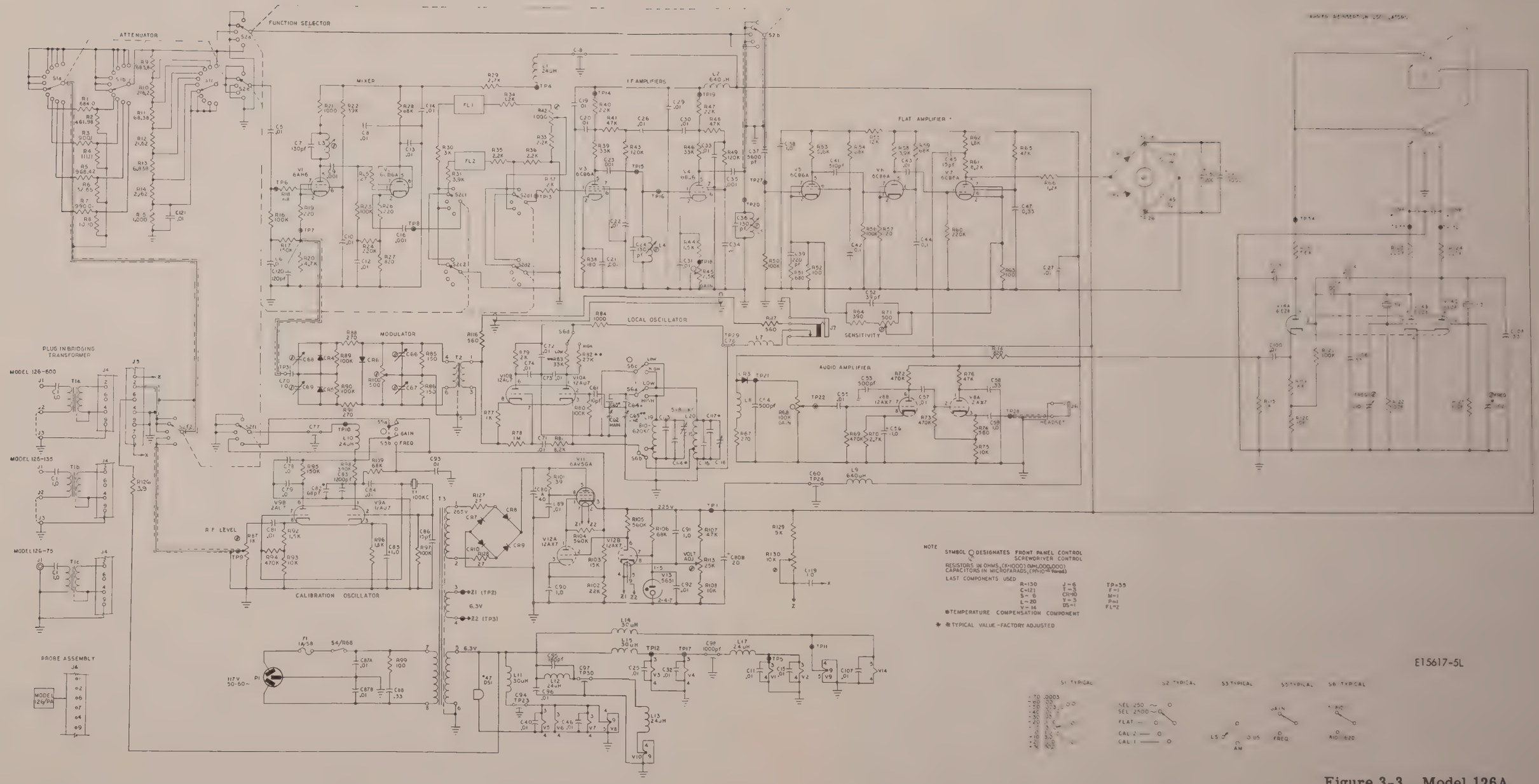

Figure 3-3. Model 126A Schematic Diagram

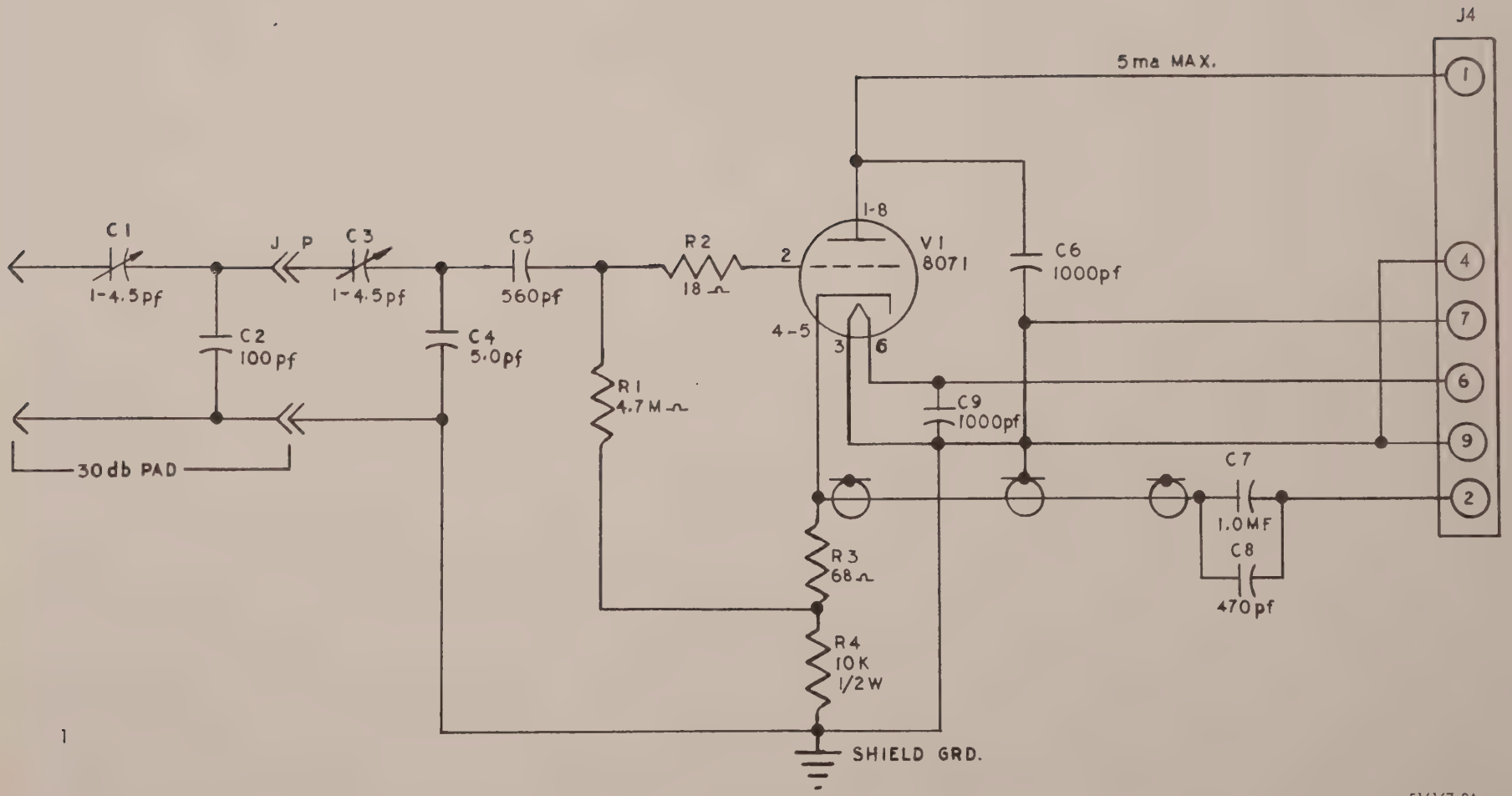

Figure 3-4. Model 126/PA Schematic Diagram

SECTION IV

REPLACEABLE PARTS LIST

PARTS REPLACEMENT

Standard components have been used in this instrument whenever possible. Both standard and special components may be ordered direct from the factory.

When ordering parts always include:

1. Sierra Stock Number.
2. Circuit Reference and Commercial Description.
3. Name, Model and Serial Number of the Instrument.

Parts for this instrument, or further service information may be obtained from:

SIERRA ELECTRONIC OPERATION
Philco-Ford Corporation
3885 Bohannon Drive
Menlo Park, California 94025

Telephone (415) 322-7222
TWX 910-373-1282

1. INTRODUCTION

a. The following pages list the replaceable parts for Models 126A, 126-600, 126-135, 126-75 and 126/PA.

2. Tabular Listing

TABLE 4-1 REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
C1	CAPACITOR, 1 MF,400 VDCW,±20% Paper PC	902440105	Reliable	RC220B	2
C2	Not Used				
C3	Not Used				
C4	Not Used				
C5	CAPACITOR,.01 mf, 150 VDCW Disc Ceramic	901440103	Centralab	DDM-103	12
C6	Same As C5				
C7	CAPACITOR, 130 pf, 500 VDCW ±2% Silver Mica	902070131	Elmenco	CM-15E-131	3
C8	CAPACITOR, .01 mf, 600 VDCW Disc Ceramic	901420103	Erie	811-.01	29
C9	CAPACITOR, .001 mf, 500 VDCW Disc Ceramic	901400102	Erie	801-.001	7
C10	Same As C8				
C11	Same As C5				
C12	Same As C8				
C13	Same As C8				
C14	Same As C8				
C15	Same As C5				
C16	Same As C9				
C17	Not Used				
C18	CAPACITOR, 1000 pf,500 VDCW Ceramic Feed Thru	902630102	Erie	327-102	7
C19	Same As C8				
C20	Same As C8				
C21	Same As C9				
C22	Same As C8				
C23	Same As C9				
C24	Same As C7				
C25	Same As C5				
C26	Same As C8				
C27	Same As C8				
C28	Not Used				
C29	Same As C8				
C30	Same As C8				
C31	Same As C5				
C32	Same As C5				
C33	Same As C8				
C34	Same As C8				
C35	Same As C9				
C36	Same As C7				
C37	CAPACITOR,5600 pf,600 VDCW ±10% Paper Mylar	901100562	Cornell-Dubiler	DPMS6D56	1
C38	Same As C1				
C39	CAPACITOR,200 pf,300 VDCW ±2% Silver Mica	902070221	Elmenco	CM-15E-221	1
C40	Same As C5				
C41	CAPACITOR,510 pf,300 VDCW ±2% Silver Mica	902070511	Elmenco	CM-15E-511G	1
C42	CAPACITOR, .1 mf, 400 VDCW, Paper	901050104	Sprague	4SE-P10	4
C43	Same As C8				
C44	Same As C42				
C45	CAPACITOR, 15 pf, ±5% Silver Mica	902010150	Elmenco	CM-15C-150J	1
C46	Same As C5				
C47	CAPACITOR, .33 mf, 400 VDCW Paper Tubular	901010334	Sprague	4SE-P33	2
C48	Same As C42				
C49	Same As C42				
C50	CAPACITOR, 200 mf,6 VDCW Electrolytic	902210207	Sprague	VL-1108	1
C51	CAPACITOR, 1000 mf,6 VDCW Electrolytic 85°C	902230108	Pyramid	TD-1000-6	1
C52	CAPACITOR, 39 pf, 500 VDCW ±2% Silver Mica	902070390	Elmenco	CM-15E-390	1
C53	CAPACITOR, 500 pf, ±2% Disc Ceramic 1000 VDCW	901410501	Centralab	DD501	2
C54	Same As C53				
C55	Same As C5				
C56	CAPACITOR, 1.0 mf, 50 VDCW Electrolytic	902220105	Sprague	VL-1300	2

3

TABLE 4-1 (continued) REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
C57	Same As C8				
C58	Same As C47				
C59	CAPACITOR, 1.0 mf, 200 VDCW, Metalized Paper	902410105	Cornell-Dubiler	MPX2W1	4
C60	Same As C18				
C61	CAPACITOR, 10 pf, ±2%, NPO, Tubular Hi Kap	901420100	Centralab	TCZ-10	1
C62	CAPACITOR, Variable	902800001	Radio Condenser	SS-13416-1	1
C63	CAPACITOR, 750 pf, ±2% at 25°C N750, Ceramic CC45	901410751	Sierra	SS-16235-1	2
C64	Same As C63				
C65	CAPACITOR, Factory Adjusted		Sierra	SS-13416-1	1
C66	CAPACITOR, 0.6-14 pf, NPO, Glass Trimmer	903000120	JFD Electronics	VC-11G	6
C67	Same As C66				
C68	Same As C66				
C69	Same As C66				
C70	Same As C59				
C71	Same As C8				
C72	Same As C8				
C73	Same As C8				
C74	Same As C8				
C75	CAPACITOR, 470 pf, ±2%, Silver Mica	902070471	Elmenco	CM-15E-471	1
C76	Same As C18				
C77	Same As C18				
C78	Same As C8				
C79	Same As C8				
C80	CAPACITOR, 40-20 mf, 450 VDCW Electrolytic	902210402	Sierra	SS-17672-1	1
C81	Same As C5				
C82	CAPACITOR, 68 pf, 1200 VDCW, ±2%, Coeff. N330	901410680	Centralab	TCA68	1
C83	CAPACITOR, 1200 pf, 500 VDCW, ±2%, Silver Mica	902070122	Elmenco	CM-19E-122	1
C84	Same As C8				
C85	Same As C56				
C86	CAPACITOR, 15 pf, 500 VDCW ±2%, Silver Mica	902070150	Elmenco	CM-15E-150G	1
C87	CAPACITOR, 2X.01 mf, 500 VDCW Ceramic Disc	901450103	Centralab	DD3-103	2
C88	CAPACITOR, .33 mf, 400 VDCW, Metalized Paper	902410334	Cornell-Dubiler	MPX4P33	1
C89	Same As C8				
C90	Same As C59				
C91	Same As C59				
C92	Same As C8				
C93	Same As C8				
C94	Same As C18				
C95	CAPACITOR, 180 pf, 500 VDCW, 2% Silver Mica	902070181	Erie	CM-15E-181	1
C96	Same As C8				
C97	Same As C18				
C98	Same As C18				
C99	Not Used				
C100	Same As C5				
C101	CAPACITOR, 4.5 - 25 pf	903200250	Erie	TS2A-NPO	2
C102	Same As C101				
C103	Same As C8				
C104	Same As C9				
C105	Same As C9				
C106	CAPACITOR, 33 pf, 500 VDCW, ±2% Silver Mica	902070330	Elmenco	CM-15E-330	2
C107	Same As C8				
C108	Same As C106				
C109	Same As C87				
C110	Not Used				

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TABLE 4-1 (continued) REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
C111	Not Used				
C112	Not Used				
C113	CAPACITOR, 150 pf ±2% NPO Ceramic	901400151	Centralab	TCZ-150	1
C114	CAPACITOR, 47 pf N330 Ceramic	901440470	Centralab	TCA-47	1
C115	Same As C66				
C116	CAPACITOR, 87 pf NPO Ceramic	901410820	Centralab	TCZ-87	1
C117	CAPACITOR, 47 pf, N470 Ceramic	901430470	Centralab	CC20	1
C118	Same As C66				
C119	CAPACITOR, 1.0 Mf, 400 VDCW, ±5% Encapsulated	902430105	Texas Capacitor	Type 31 FW	1
C120	CAPACITOR, 120 pf ±2%, 500 VDCW	902070121	Elmenco	CM-15-E-121G	1
C121	CAPACITOR, .01 mf Disc Ceramic 600 VDCW	901420103	Centralab	DD-6103	1
CR1	DIODE, Silicon	910500010	Transitron	S10G	2
CR2	Same A CR1				
CR3	DIODE, 1N34A, Germanium	910501534	Sylvania	1N34A	2
CR4	DIODE, Germanium	910500028	Hughes	1812	2
CR5	Same As CR4				
CR6	Same As CR3				
CR7	RECTIFIER, 600 PIV, 750 ma	910800008	Diode Inc.	DI 56	4
CR8	Same As CR7				
CR9	Same As CR7				
CR10	Same As CR7				
DS1	PILOT LIGHT, Bayonet Base	913800001	National Union	No. 47	1
F1	FUSE, 1.0 Amp. Slo-Blo	913200013	Littelfuse	313001	1
FL1	CRYSTAL FILTER, 2.215 mc, 250 Cycle Bandpass	910100004	Sierra	SS-14485-1	1
FL2	CRYSTAL FILTER, 2.215 mc, 2800 Cycle Bandpass	910100005	Sierra	SS-14486-1	1
J1	P/O Plug-In Units				
J2	P/O Plug-In Units				
J3	P/O Plug-In Units				
J4	PLUG, Min. Rac 17	914600064	Amphenol	17-21090	1
J5	RECEPTACLE, Min. Rac 17	914900004	Amphenol	17-11090	1
J6	JACK, Telephone	914400014	Switchcraft	13E-JAX	2
J7	Same as J6				
L1	INDUCTOR, 24 mh, 300 Ma	909000097	Miller	4626	5
L2	INDUCTOR, 640 Microhenries	044931000	Sierra	SS-4493-1	3
L3	INDUCTOR, 30-38 Microhenries, Variable	127561000	Sierra	SS-12756-1	3
L4	Same as L3				
L5	Same As L3				
L6	Not Used				
L7	Same As L2				
L8	INDUCTOR, 100 Microhenries	909000103	J. Millen	J-301-100	1
L9	Same As L2				
L10	Same As L1				
L11	INDUCTOR, 30 Microhenries, 1.5 Amp	127971000	Sierra	SS-12797-1	3
L12	Same As L1				
L13	Same As L1				
L14	Same As L11				
L15	Same As L11				
L16	Not Used				
L17	Same As L1				
L18	Not Used				
L19	INDUCTOR, Variable	147791000	Sierra	SS-14779-1	1

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TABLE 4-1 (continued) REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
L20	INDUCTOR, Variable	147771000	Sierra	SS-14777-1	1
M1	METER, 0-1.0 ma dc,	911800045	Beede	SS-14218-1	1
P1	POWER CORD	916400002			1
R1	RESISTOR, 684.0 ohm ±1%, 1/2W Deposited Carbon	907400098	Electra	DC-1/2C	1
R2	RESISTOR, 461.98 ohm ±1%, 1/2W Deposited Carbon	907400099	Electra	DC-1/2C	1
R3	RESISTOR, 900.1 ohm ±1%, 1/2W Deposited Carbon	907400095	Electra	DC-1/2C	1
R4	RESISTOR, 111.11 ohm ±1%, 1/2W Deposited Carbon	907400097	Electra	DC-1/2C	1
R5	RESISTOR, 968.42 ohm ±1%, 1/2W Deposited Carbon	907400094	Electra	DC-1/2C	1
R6	RESISTOR, 32.65 ohm ±1%, 1/2W Deposited Carbon	907400103	Electra	DC-1/2C	1
R7	RESISTOR, 990.01 ohm ±1%, 1/2W Deposited Carbon	907400093	Electra	DC-1/2C	1
R8	RESISTOR, 10.10 ohm ±1%, 1/2W Deposited Carbon	907400100	Electra	DC-1/2C	1
R9	RESISTOR, 683.8 ohm ±1%, 1/2W Deposited Carbon	907400022	Electra	DC-1/2C	1
R10	RESISTOR, 216.2 ohm ±1%, 1/2W Deposited Carbon	907400020	Electra	DC-1/2C	1
R11	RESISTOR, 68.38 ohm ±1%, 1/2W Deposited Carbon	907400018	Electra	DC-1/2C	1
R12	RESISTOR, 21.62 ohm ±1%, 1/2W Deposited Carbon	907400017	Electra	DC-1/2C	1
R13	RESISTOR, 6.838 ohm ±1%, 1/2W Deposited Carbon	907400089	Electra	DC-1/2C	1
R14	RESISTOR, 2.162 ohm ±1%, 1/2W Deposited Carbon	907400090	Electra	DC-1/2C	1
R15	RESISTOR, 1.000 ohm ±1%, 1/2W Deposited Carbon	907400091	Electra	DC-1/2C	1
R16	RESISTOR, 100,000 ohm ±10%, 1/2W Fixed Comp.	905200104	Allen Bradley	Type EB	6
R17	RESISTOR, 150,000 ohm±10%, 1/2W Fixed Comp.	905200154	Allen Bradley	Type EB	1
R18	RESISTOR, 68 ohm ±10%, 1/2W Fixed Composition	905200680	Allen Bradley	Type EB	1
R19	RESISTOR, 220 ohm ±5%, 1/2W Fixed Composition	905000221	Allen Bradley	Type EB	2
R20	RESISTOR, 4700 ohm ±5%, 1/2W Fixed Composition	905000427	Allen Bradley	Type EB	1
R21	RESISTOR, 1,000 ohm ±5%, 1/2W Fixed Composition	905000102	Allen Bradley	Type EB	3
R22	RESISTOR, 39,000 ohm ±5%, 1/2W Fixed Compsoition	905000393	Allen Bradley	Type EB	1
R23	Same As R16				
R24	RESISTOR, 220,000 ohm, ±10%, 1/2 Fixed Comp.	905200224	Allen Bradley	Type EB	2
R25	RESISTOR, 27 ohm ±10%, 1/2W Fixed Composition	905200270	Allen Bradley	Type EB	1
R26	Same As R19				
R27	RESISTOR, 820 ohm ±5%, 1/2W Fixed Composition	905000821	Allen Bradley	Type EB	2
R28	RESISTOR, 68,000 ohm ±5%, 1/2W Fixed Comp.	905000683	Allen Bradley	Type EB	2
R29	RESISTOR, 2,700 ohm ±5%, 1/2W Fixed Comp.	905000272	Allen Bradley	Type EB	2
R30	RESISTOR, 3,000 ohm ±5%, 1/2W Fixed Comp.	905000302	Allen Bradley	Type EB	1
R31	RESISTOR, 3,900 ohm ±5%, 1/2W Fixed Comp.	905000392	Allen Bradley	Type EB	1
R32	Not Used				
R33	RESISTOR, 2,200 ohm ±5%, 1/2W Fixed Comp.	905000222	Allen Bradley	Type EB	3
R34	RESISTOR, 1,200 ohm ±5%, 1/2W Fixed Comp.	905000122	Allen Bradley	Type EB	1
R35	Same As R33				
R36	Same As R33				
R37	RESISTOR, 2,000 ohm ±5%, 1/2W Fixed Comp.	905000202	Allen Bradley	Type EB	2
R38	RESISTOR, 180 ohm ±5%, 1/2W Fixed Comp.	905000181	Allen Bradley	Type EB	1
R39	RESISTOR, 33,000 ohm ±10%, 1/2W Fixed Comp.	905200333	Allen Bradley	Type EB	1
R40	RESISTOR, 22,000 ohm ±10%, 1/2W Fixed Comp.	905200223	Allen Bradley	Type EB	2
R41	RESISTOR, 47,000 ohm ±10%, 1/2W Fixed Comp.	905200473	Allen Bradley	Type EB	4
R42	POTENTIOMETER 1000 ohm, Type UPE-70	907900105	CTS	32275	2
R43	RESISTOR, 120,000 ohm ±10%, 1/2W Fixed Comp.	905200124	Allen Bradley	Type EB	2
R44	Same As R27				
R45	POTENTIOMETER, 2,500 ohm 2W Composition	907900152	CTS Series HT321	Spec. #35774	1
R46	RESISTOR, 33,000 ohm +5%, 1/2W Fixed Comp	905000333	Allen Bradley	Type EB	1
R47	Same As R40				
R48	Same As R41				

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TABLE 4-1 (continued) REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
R49	Same As R43				
R50	Same As R16				
R51	RESISTOR, 680 ohm ±5%, 1/2W Fixed Composition	905000681	Allen Bradley	Type EB	1
R52	RESISTOR, 100 ohm ±5%, 1/2W Fixed Composition	905000101	Allen Bradley	Type EB	2
R53	RESISTOR, 5,600 ohm ±10%, 1/2W Fixed Comp.	905200562	Allen Bradley	Type EB	1
R54	RESISTOR, 68,000 ohm ±10%, 1/2W Fixed Comp.	905200683	Allen Bradley	Type EB	2
R55	RESISTOR, 12,000 ohm ±10%, 1/2W Fixed Comp.	905200123	Allen Bradley	Type EB	1
R56	Same As R16				
R57	RESISTOR, 120 ohm ±5%, 1/2W Fixed Composition	905000121	Allen Bradley	Type EB	1
R58	RESISTOR, 3,900 ohm ±10%, 1W Fixed Composition	905600392	Allen Bradley	Type GB	1
R59	Same As R54				
R60	Same As R24				
R61	RESISTOR, 8,200 ohm ±5%, 1W Fixed Composition	905400822	Allen Bradley	Type GB	1
R62	RESISTOR, 1,800 ohm ±5%, 1/2W Fixed Composition	905000182	Allen Bradley	Type EB	2
R63	Same As R52				
R64	RESISTOR, 390 ohm ±5%, 1/2W Fixed Composition	905000391	Allen Bradley	Type EB	1
R65	Same As R41				
R66	RESISTOR, 1,200 ohm ±10%, 1/2W Fixed Comp.	905200122	Allen Bradley	Type EB	1
R67	RESISTOR, 270 ohm ±10%, 1/2W Fixed Composition	905200271	Allen Bradley	Type EB	1
R68	POTENTIOMETER, 100,000 ohm 2W Comp. Switch Section	907900071	Sierra	SS-393-3-45	1
R69	RESISTOR, 470,000 ohm ±10%, 1/2W Fixed Comp.	905200474	Allen Bradley	Type EB	4
R70	Same As R29				
R71	POTENTIOMETER, 500 ohm, 1/2W, Taper 1, Comp.	907900100	Stackpole	LH61	1
R72	Same As R69				
R73	Same As R69				
R74	RESISTOR, 560 ohm ±5%, 1/2W Fixed Composition	905000561	Allen Bradley	Type EB	3
R75	RESISTOR, 10,000 ohm ±10%, 1/2W Fixed Comp.	905200103	Allen Bradley	Type EB	2
R76	Same As R41				
R77	Same As R21				
R78	RESISTOR, 1 Meg. Ohm ±10%, 1/2W Fixed Comp.	905200105	Allen Bradley	Type EB	1
R79	Same As R37				
R80	Same As R16				
R81	RESISTOR, 8,200 ohm ±5%, 1/2 W Fixed Comp.	905000822	Allen Bradley	Type EB	1
R82	RESISTOR, 27K, 5%, 1/2W Fixed Composition	905000273	Allen Bradley	Type EB	1
R83	RESISTOR, 33K, 5%, 1/2W Fixed Composition	905000333	Allen Bradley	Type EB	1
R84	Same as R21				
R85	RESISTOR, 150 ohm ±5%, 1/2W Fixed Composition	905000151	Allen Bradley	Type EB	2
R86	Same As R85				
R87	Same As R42				
R88	RESISTOR, 270 ohm ±5%, 1/2W Fixed Composition	905000271	Allen Bradley	Type EB	2
R89	RESISTOR, 100,000 ohm ±5%, 1/2W Fixed Comp.	905000104	Allen Bradley	Type EB	5
R90	Same As R89				
R91	Same As R88				
R92	RESISTOR, 1500 ohm ±5%, 1/2W Fixed Composition	905000152	Allen Bradley	Type EB	1
R93	Same As R75				
R94	Same As R69				
R95	RESISTOR, 150,000 ohm ±5%, 1/2W Fixed Comp.	905000154	Allen Bradley	Type EB	1
R96	Same As R62				
R97	Same As R16				
R98	RESISTOR, 390,000 ohm ±5%, 1/2W Fixed Comp.	905000394	Allen Bradley	Type EB	1
R99	RESISTOR, 100 ohm ±10%, 1/2W Fixed Comp.	905200101	Allen Bradley	Type EB	1
R100	POTENTIOMETER, 500 ohm, 1/4W, Composition (Lug Terminals)	907900102	Allen Bradley	Type R	1
R101	RESISTOR, 39 ohm ±10%, 1/2 W Fixed Comp.	905200390	Allen Bradley	Type EB	1

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TABLE 4-1 (continued) REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
R102	RESISTOR, 22,000 ohm ±5%, 2W Fixed Composition	905800223	Allen Bradley	Type HB	1
R103	RESISTOR, 15,000 ohm ±5%, 2W Fixed Composition	905800153	Allen Bradley	Type HB	1
R104	RESISTOR, 560,000 ohm ±5%, 1/2W Fixed Comp.	905000564	Allen Bradley	Type EB	2
R105	Same as R104				
R106	RESISTOR, 68,000 ohm ±5%, 1W Fixed Composition	905400683	Allen Bradley	Type GB	1
R107	RESISTOR, 47,000 ohm ±5%, 1W Fixed Composition	905400473	Allen Bradley	Type GB	1
R108	RESISTOR, 10,000 ohm ±5%, 1/2W Fixed Comp.	905000103	Allen Bradley	Type EB	2
R109	Same As R28				
R110	Not Used				
R111	Not Used				
R112	Not Used				
R113	POTENTIOMETER, 25,000 ohm, Printed Circuit Type Taper 1	907900103	Stackpole	LH61	1
R114	Same As R27				
R115	RESISTOR, 1,000 ohm ±5%, 1/2W Fixed Comp.	905000102	Allen Bradley	Type EB	1
R116	Same As R74				
R117	Same As R74				
R118	RESISTOR, 56K ±5%, 1/2W Fixed Composition	905000563	Allen Bradley	Type EB	1
R119	RESISTOR, 68 ohm ±5%, 1/2W Fixed Composition	905000680	Allen Bradley	Type EB	1
R120	Same As R108				
R121	Same As R89				
R122	Same As R89				
R123	RESISTOR, 220,000 ohm ±5%, 1/2W Fixed Comp.	905000224	Allen Bradley	Type EB	2
R124	Same As R123				
R125	Same As R89				
R126	RESISTOR, 3.9 ohm ±5%, 1/2W Fixed Composition	905000039	Allen Bradley	Type EB	1
R127	RESISTOR, 27 ohm ±5% 1W Fixed Composition	905400270	Allen Bradley	Type GB	1
R128	Same As R127				
R129	RESISTOR, 15KΩ ±5%, 1/2W Fixed Composition	905000153	Allen Bradley	Type EB	1
R130	POTENTIOMETER, 10KΩ ±10%, Linear	907900127	CTC	34133	1
S1	SWITCH, Selector, 3 pole, 11 Position, 4 Section	911200056	Sierra	SS-14205-1	1
S2	SWITCH, Selector, 9 pole, 5 Position, 6 Section	911200046	Sierra	SS-12455-1	1
S3	SWITCH, Selector, 2 pole, 3 Position, 1 Section	911200058	Sierra	SS-14206-1	1
S4	SWITCH, On-Off, (Part of R68 Potentiometer)	907900071	Sierra	SS-393-3-45	1
S5	SWITCH, Selector 2 pole, 2 Position, 2 Section	911200086	Sierra	SS-15752-1	1
S6	SWITCH, Selector, 4 pole, 2 Position, 2 Section	911200062	Sierra	SS-14669-1	1
T1A	See Plug-In Units				
T1B	See Plug-In Units				
T1C	See Plug-In Units				
T2	TRANSFORMER, 2:1 turns ratio	141592000	Sierra	SU-14159-2	1
T3	TRANSFORMER, Sec.#1:268 Vrms, @ 75 ma; Sec.#2:6.3 Vrms, @3.5A Sec.#3:6.3A, Primary 117 Vrms 50/60 cps	910000033	Sierra	SS-12403-1A	1
V1	VACUUM TUBE, 6AH6	910700074	Sierra	6AH6	1
V2	VACUUM TUBE, 6CB6A	910700059	Sierra	6CB6A	5
V3	Same As V2				
V4	VACUUM TUBE, 6BJ6	910700075	Sierra	6BJ6	1
V5	Same As V2				
V6	Same As V2				
V7	Same As V2				
V8	VACUUM TUBE, 12AX7	910700069	Sierra	12AX7	2
V9	VACUUM TUBE, 12AU7	910700052	Sierra	12AU7	2

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TABLE 4-1 (continued) REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
V10	Same as V9				
V11	VACUUM TUBE, 6AV5GA	910700076	Sierra	6AV5GA	1
V12	Same As V8				
V13	GAS TUBE, 5651	910700015	Sierra	5651	1
V14	VACUUM TUBE, 6EZ8	910700088	Sylvania	6EZ8	1
XDS1	PILOT LIGHT, Holder	914200008	Dialco	7-04	1
XF1	FUSE HOLDER	913400001	Littelfuse	342003	1
XV1	TUBE SOCKET, 7 pin miniature for printed board	914000036	Methode	P455	8
XV2	Same As XV1				
XV3	Same As XV1				
XV4	Same As XV1				
XV5	Same As XV1				
XV6	Same As XV1				
XV7	Same As XV1				
XV8	TUBE SOCKET, 9 pin Noval for Printed board	914000037	Methode	P465	4
XV9	Same As XV8				
XV10	TUBE SOCKET, Turret, 9 pin Noval	914000032	Vector Electronic	8N12T	1
XV11	TUBE SOCKET, Octal for printed board	914000035	Elco	611PH-1/16	1
XV12	Same As XV8				
XV13	Same As XV1				
XV14	Same As XV8				
XY1	CRYSTAL, Holder, Ceramic	914200021	Johnson	126-105	3
XY2	Same As XY1				
XY3	Same As XY1				
Y1	CRYSTAL, Quartz 100 kc, 0.01%	912200010	Northern Eng.	SS-13198-1	1
Y2	CRYSTAL, Quartz 2,213.5 KC, .005%	912200011	Northern Eng.	SS-13417-1	1
Y3	CRYSTAL, Quartz 2,216.5 KC, .005%	912200012	Northern Eng.	SS-13418-1	1

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REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	TABLE 4-2 MODEL 126-600 Plug-In Unit				
C1	CAPACITOR, 1.0 mf, 400 VDCW,±5% Encapsulated	902440105	Texas Capacitor	1017	1
J1	BINDING POST, Insulated	915200003	General Radio	938-C	2
J2	Same As J1				
J3	BINDING POST, Grounding	915200004	General Radio	938-WB	1
P1	PLUG, Min-Rac Type 17, 5 Contacts	914600060	Amphenol	17-21090	1
T1A	TRANSFORMER, 600 Ohm	147821000	Sierra	SP-14782-1	1
	TABLE 4-3 MODEL 126-135 Plug-In Unit				
C1	CAPACITOR, 1.0 mf, 400 VDCW,±5% Encapsulated	902440105	Texas Capacitor	1017	1
J1	BINDING POST, Insulated	915200003	General Radio	938-C	2
J2	Same As J1				
J3	BINDING POST, Grounding	915200004	General Radio	938-WB	1
P1	PLUG, Min-Rac Type 17, 5 Contacts	914600060	Amphenol	17-21090	1
T1B	TRANSFORMER, 135 Ohm	147811000	Sierra	SP-14781-1	1
	TABLE 4-4 MODEL 126-75 Plug-In Unit				
C1	CAPACITOR, 1.0 mf, 400 VDCW,±5% Encapsulated	902440105	Texas Capacitor	1017	
J1	JACK, Panel, BNC	914800043	Amphenol	UG657/U	1
J2	Not Used				
J3	Not Used				
P1	PLUG, Min-Rac Type 17, 5 Contacts	914600060	Amphenol	17-21090	1
T1C	TRANSFORMER, 75 Ohm	147801000	Sierra	SP-14780-1	1
	TABLE 4-5 MODEL 126/PA Unit				
C1	CAPACITOR, Variable, .8-4.5pF, Glass Piston	903000845	JFD	VC-21G	2
C2	CAPACITOR, Fixed 100 pF, ±1%, Mica Disc	901800017	Sangamo	M55	1
C3	Same As C1				
C4	CAPACITOR, Fixed 5.0 pF, 5%, Glass Dielectric	902900003	Erie	CY10	1
C5	CAPACITOR, Fixed, 560 pF, 200 Vdcw, 10% Ceramic	901300561	Vitramon	VK20CW561K	1
C6	CAPACITOR, Fixed,1000 pF, 200 Vdcw, 10% Ceramic	901300102	Vitramon	VK20CW102K	2
C7	CAPACITOR, Fixed, 1.0 pF, 400 Vdcw, ±5%	902440105	Texas Capacitor	1017	1
C8	CAPACITOR, Fixed, 470 pF, ±2%, Silver Mica	902070471	Elmenco	CM-15E-471	1
C9	Same As C6				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	TABLE 4-5 MODEL 126/PA Unit (continued)				
J4	PLUG, Min-Rac, Type 17, 5 Contacts	914600060	Amphenol	17-21090	1
R1	RESISTOR, Fixed, 4.7MΩ, ±5%, 1/4 W	906900475	Allen Bradley	Type CR	1
R2	RESISTOR, Fixed, 18Ω, ±5%, 1/4 W	906900180	Allen Bradley	Type CR	1
R3	RESISTOR, Fixed, 68Ω, ±5%, 1/4 W	906900680	Allen Bradley	Type CR	1
R4	RESISTOR, Fixed, 10,000Ω ±5%, 1/2 W	905000103	Allen Bradley	Type EB	1
V1	ELECTRON TUBE, Subminiature Triode	910700097	Sylvania	SR-2942B	1
XV1	SOCKET, 8 Pin	914000012	Cinch	142-13686	1

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INSTRUCTION MANUAL

UNIVERSAL SPEAKER KIT

A02509900A

Price $2.50

APRIL 1967

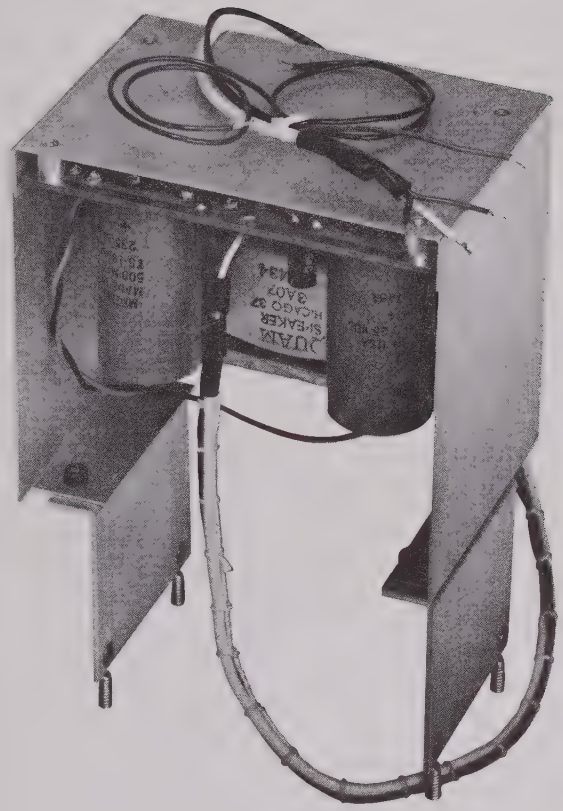

Figure 1. Speaker Assembly with Model 125/126 Brackets

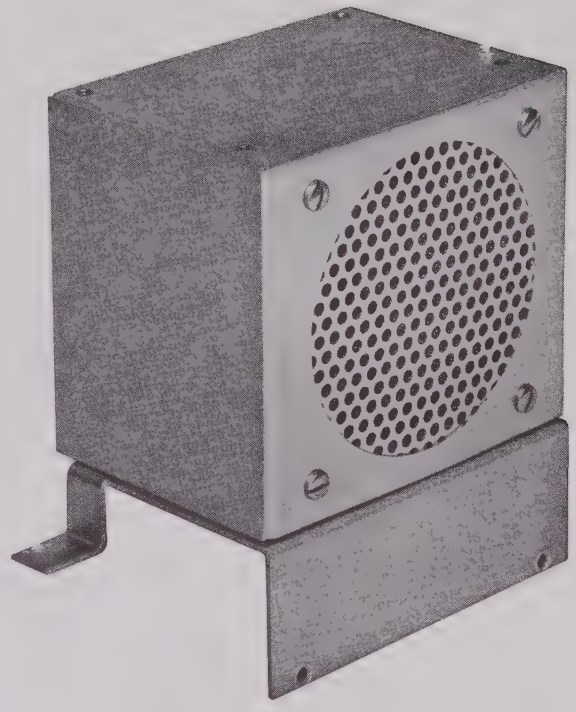

Figure 2. Speaker Assembly with Model 128 Brackets

UNIVERSAL SPEAKER KIT

DESCRIPTION

The Sierra Universal Speaker Kit is made for use with all series and versions of the Sierra Models 125, 126 and 128 Frequency Selective Voltmeters. Installation of the Kit provides loud speaker monitoring of the audio modulation on the carrier signal being measured.

The Kit is made up of an audio amplifier and speaker mounted in a speaker case, a connecting cable and panel jack, and the required mounting brackets and hardware.

The three transistor amplifier, consisting of a driver stage and push-pull output stage, furnishes sufficient power to provide adequate speaker volume. Output level to either the speaker or headphones is controlled by the Voltmeter Audio Gain control. Power for the amplifier is taken from the Voltmeter, either through a dropping resistor from the power supply of the Model 128, or through a voltage doubling rectifier from the filament supply of the Model 125 or 126. The rectifier and dropping resistor are mounted on the speaker audio circuit board. The jack furnished with the kit, when installed to replace the Phones jack originally in the Voltmeter, switches off the speaker whenever headphones are plugged into the Voltmeter Phones jack.

SPECIFICATIONS

FREQUENCY RANGE	300 cps to 5 kc
Installed In Voltmeter	300 cps to 2.5 kc
FREQUENCY RESPONSE	±1 db
INPUT	2 volts p-p maximum
OUTPUT	0.25 watts undistorted
POWER REQUIREMENTS	
From Models 125, 126	6.3 volts AC, 120 ma, 50-1000 cps
From Model 128	-24 volts DC, 45 ma

SPECIFICATIONS (continued)

DIMENSIONS (without brackets)	
Height	3-5/8 inches
Width	4 inches
Depth	2-7/8 inches
WEIGHT (without brackets)	14 ounces
SIERRA PART NO.	B02074000

INSTALLATION PROCEDURE

1. Solder VIOLET wire to proper terminal on Speaker Kit circuit board.

   For Models 125 and 126 - to terminal marked 6.3 vac.(Figure 5).
   For Model 128 - to terminal marked -24 vdc. (Figure 6).

2. Drill holes in chassis as required:

   For Models 125 and 126, see Figure 3.
   For Model 128, see Figure 4.

   Later production runs of all models will have the holes pre-punched in the chassis.

3. Select brackets required and attach to speaker case:

   For Models 125 and 126, see Figure 1.
   For Model 128, see Figure 2.

4. Fasten speaker case to chassis by means of brackets.

   For Models 125 and 126, use number 6 Kep nuts on spade lugs.
   For Model 128, use number 4 machine screws and Kep nuts.

   (In the -Y version of the Model 125, the "existing holes", Figure 3, are used to attach an under-chassis shield bracket. The screws in these holes are to be removed. The spade lugs on the speaker brackets replace them to hold both the speaker case and the under-chassis shield bracket.)

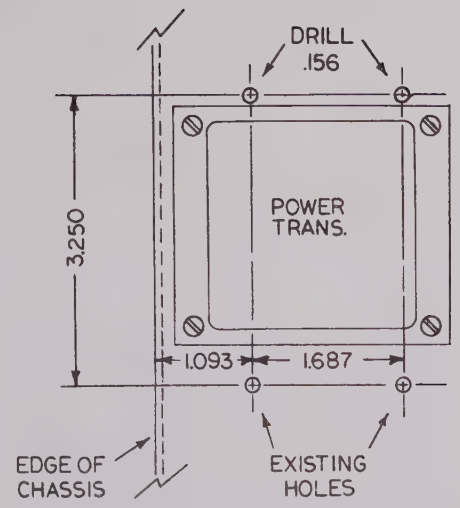

Figure 3. Mounting Hole Location Model 125/126

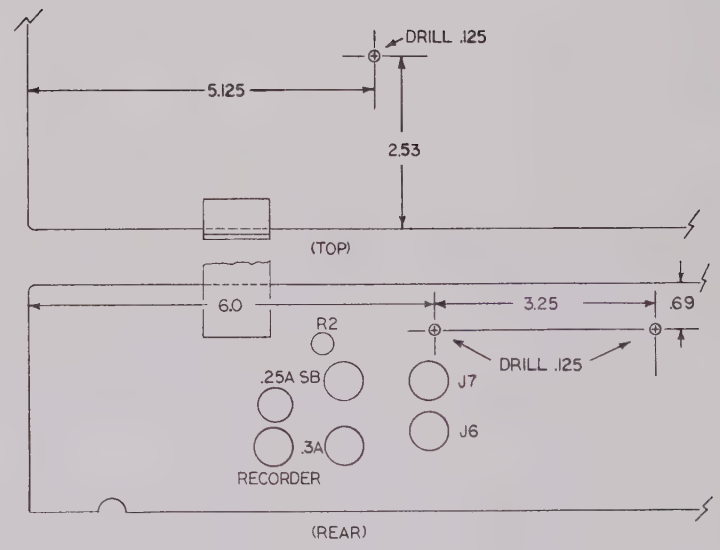

Figure 4. Mounting Hole Location Model 128

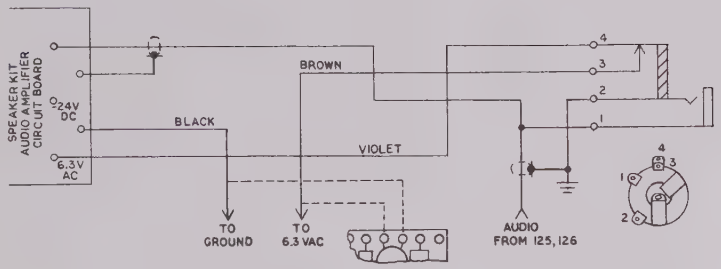

Figure 5. Wiring Diagram Model 125/126

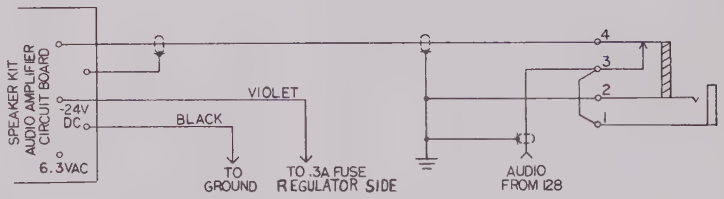

Figure 6. Wiring Diagram Model 128

5. Run Speaker Kit cable into bottom of chassis.

In Models 125 and 126, lay cable in front of Mixer module cover and run down through space between RF tuning casting and chassis. Secure cable to projecting meter stud with plastic cable clamp and 6-32 Kep nut.

In Model 128, run cable down through large rubber grommet near center of chassis.

6. Disconnect leads from PHONES jack. Remove old jack and install the jack supplied with the kit. (Later production runs of all models will contain the new type jack as standard equipment.)

7. Reconnect audio leads and connect free end of speaker cable to jack according to wiring diagram. Connect Brown and Black leads to circuit board.

For Models 125 and 126 use Figure 5. Lead length is such that wiring runs are direct.

For Model 128 use Figure 6 and following procedure:

a. Remove shield cover from Audio circuit board of the 128 Voltmeter.

b. Pull the Violet and Black wires out of the cable tie near the free end.

c. Connect the Audio lead from the Model 128 Audio circuit board to jack terminal 1.

d. Run the Audio lead of the speaker cable underneath the Model 128 Audio circuit board and connect to jack terminal 4. Connect shield and ground lead from Audio circuit board to jack terminal 2.

e. Cut off the long free end of the Brown wire. Leave enough to make the jumper connection from terminal 1 to 3 on the jack, as indicated in Figure 6.

f. Cut the Black lead to a convenient length and connect to one of the ground lugs near the power supply circuit board.

g. Connect the free end of the Violet wire to the regulator side of the .3A fuse.

h. Replace cover over Audio circuit board.

UNIVERSAL SPEAKER KIT

LIST OF PARTS IN KIT

1 - Speaker assembly, with speaker and printed circuit board amplifier mounted in the case, and the interconnecting cable attached to the circuit board, except for the Violet wire.

1 - Single circuit jack, with switching contacts.

2 - Speaker mounting brackets with spade lugs attached. (For Models 125 and 126)

1 - Speaker mounting bracket for Model 128.

5 - 6-32 Kep nuts.

7 - 4-40 x 5/16 BHNP machine screws.

3 - 4-40 Kep nuts.

1 - 3/16" plastic cable clamp.

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
C1	CAPACITOR, 1 µf, 25V	903300105			1
C2	CAPACITOR, 500 µf, 25V	902210507	Mallory	PTC	2
C3	Same as C2				
C4	CAPACITOR, 22 mf, 25V	903300226			1
CR1	DIODE	910500031		1N456	1
CR2	DIODE	910800008		DI 56	2
CR3	Same as CR2				
J1	CONNECTOR, Phone	914400014	Switchcraft	Littel Jak #13E	1
LS1	LOUDSPEAKER	921400002	Quam	3A07	1
Q1	TRANSISTOR, PNP	910300007	G.E.	2N404	1
Q2	TRANSISTOR, NPN	910300033	G.E.	7A31	2
R1	RESISTOR, 33K Ohm ±5% 1/4W	906900333	A.B.	CB	1
R2	RESISTOR, 10K Ohm ±5% 1/4W	906900103	A.B.	CB	1
R3	RESISTOR, 2.2K Ohm ±5% 1/4W	906900222	A.B.	CB	1
R4	RESISTOR, 22K Ohm ±5% 1/4W	906900223	A.B.	CB	2
R5	Same as R4				
R6	RESISTOR, 4.7 Ohm ±10% 1/4W	907100470	A.B.	CB	2
R7	Same as R6				
R8	RESISTOR, 180 Ohm ±5% 1/2W	905000181	A.B.	EB	1
R9	RESISTOR, 3.3K ±5% 1/4W	906900332	A.B.	CB	1
T1	TRANSFORMER, Transistor P-P Input	910000072	UTC	SSO-8	1
T2	TRANSFORMER, Transistor P-P Output	910000074	UTC	0-22	1
	CABLE CLAMP	915300010			1

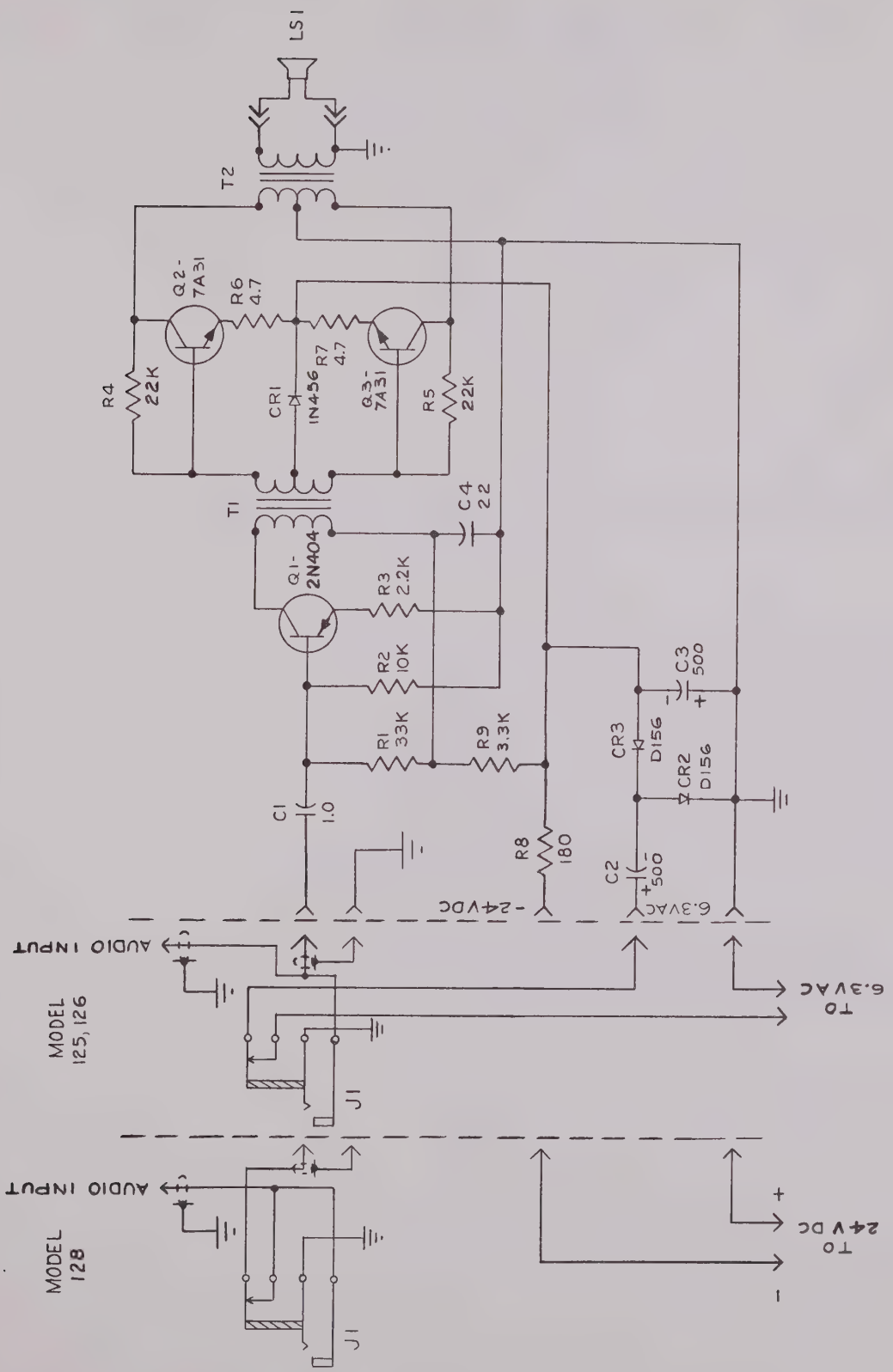

Figure 7. Universal Speaker Kit Schematic Diagram

PHILCO-FORD CORPORATION
Sierra Electronic Operation
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TELEPHONE (415) 322-7222 TWX 910-373-1282

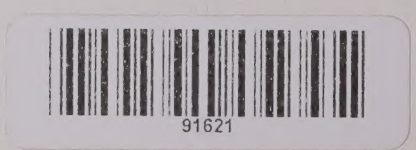
Warranty

SIERRA ELECTRONIC OPERATION, PHILCO-FORD CORPORATION warrants instruments manufactured by it and bearing Sierra commercial model numbers, except Infrared Cells, to be free from defective material and factory workmanship and agrees to repair such instruments, which under normal use and service, disclose the defects to be the fault of our manufacturing. Our obligation under this warranty is limited to repairing any such instrument which in our sole opinion upon our examination proves to be so defective, when returned to our factory at 3885 Bohannon Drive, Menlo Park, California 94025, transportation prepaid by the purchaser, within one year from the date of original purchase from us.

This warranty does not apply to any products which have been repaired, worked upon or altered by persons not authorized by us so as, in our sole judgement, to injure the stability or reliability of such instrument, or which have been subject to misuse, negligence or accident, or the serial number of which has been altered, effaced, or removed. Neither does this warranty apply to any of our products which have been connected, installed, used or adjusted otherwise than in accordance with the instructions furnished by us. Nor does SIERRA assume any liability for consequential damages, and in any event our liability shall in no case exceed the original purchase price of the instrument. Accessories, including but not limited to all vacuum tubes, fuses and batteries, not of our manufacture used with this product are not covered by this warranty.

SIERRA reserves the right to make changes in the design or construction of any of its instruments at any time without incurring any obligation to make any changes whatever on units previously purchased.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to represent nor assume for us any liability in connection with the sale of our products other than set forth herein.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